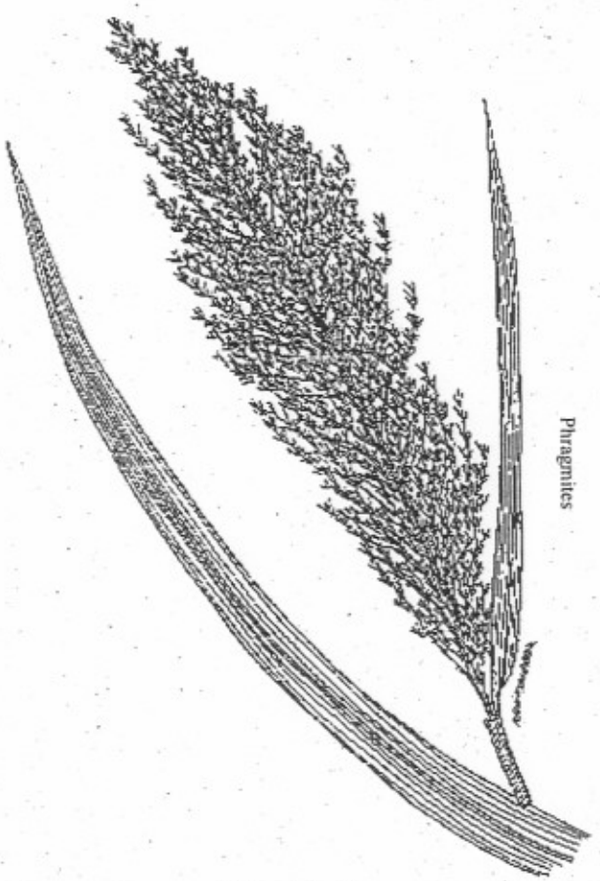
Strategic Plan for Managing Alien Invasive Vegetation:

George Washington Birthplace National Monument

Washington's Birthplace, Virginia



Submitted by:
James Åkerson, Forest Ecologist
Virginia Invasive Vegetation Management Team
Rijk Moräwe, Resource Management Specialist
George Washington Birthplace National Monument

February 2000

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Washington's Birthplace, Virginia

Natural Resources Specialist _____ Date 4 May 2000
Rijk Moräwe

Chief Ranger _____ Date 5/1/00
Larry Trombello

Superintendent _____ Date 5-1-00
David P. Herrera
Acting Superintendent

Categorical Exclusion Form

Project: Alien Invasive Vegetation Monitoring & Control **Date**: February 10, 1999

Describe project, including location (reference the attached Environmental Screening Form, if appropriate):

Refer to the attached Environmental Screening Form and the attached *Strategic Plan for Managing Alien Invasive Vegetation.*

Describe the category used to exclude action from further NEPA analysis and indicate the number of the category (see Section 3-4 of NPS-12):

- Restoration of non-controversial native species into suitable habitats within their historic range, and elimination of exotic species (516 DM2 App. 7.4 E(6)).
- Stabilization by planting native plant species in disturbed areas (516 DM2 App. 7.4 E(4)).
- Non-destructive data collection, inventory, study, research, and monitoring activities (516 DM2 App. 2, 1.6).
- Day-to-day resource management and research activities (516 DM2 App. 7.4 E(2)).

Describe any public or agency involvement effort conducted (reference the attached ESF):

This is a cooperative effort of national parks within the Virginia Subcluster, Chesapeake-Allegheny Cluster, Northeast Region. Technical expertise has been drawn upon from Shenandoah National Park, the Philadelphia Support Office, and several regional exotic pest plant councils.

On the basis of the environmental impact information in the statutory compliance file, with which I am familiar, I am categorically excluding the described project from further NEPA analysis. No exceptional circumstances (e.g., all boxes in the ESF are marked "No") or conditions in section 3-6 apply, and the action is fully described in section 3-4 of NPS-12

Park Superintendent or Designee (signature) — Date: 2/24/00

Superintendent
Title

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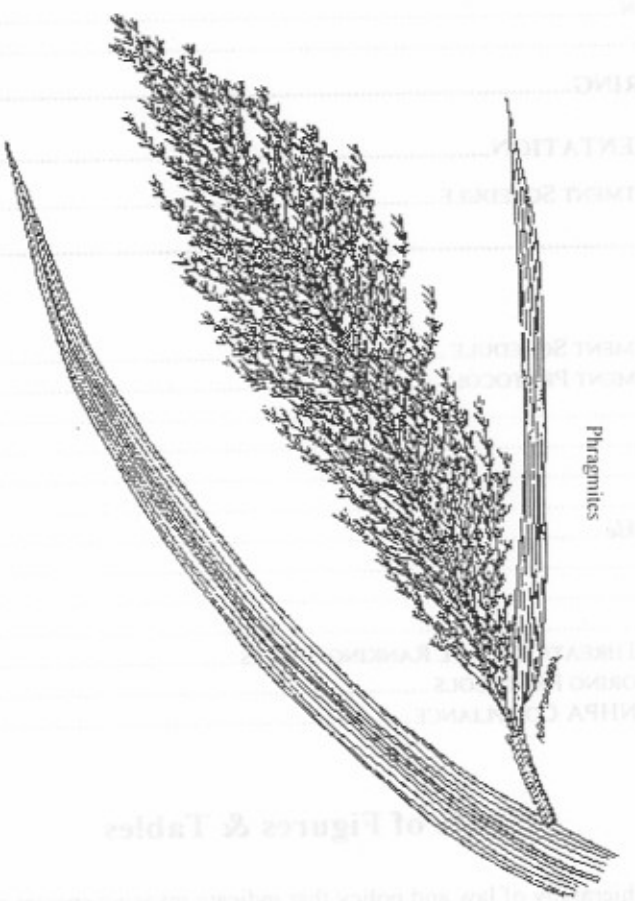

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George Washington Birthplace National Monument

February 2000

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Strategic Plan for Managing Alien Invasive Vegetation

Context & Scope

This *Strategic Plan for Managing Alien Invasive Vegetation* for the George Washington Birthplace National Historic Monument (GEWA) fits within a context of national and park derived policy aiming to preserve and protect native species, functioning ecosystems and cultural resources. **The 1916 National Park Service Organic Act** gives guidance for land management that is helpful in describing the task of resource protection.

> The service thus established shall promote and regulate the use of the Federal areas known as national parks, monuments, and reservations … by such means and measures as conform to the fundamental purpose of the said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

The charge to leave natural and historic resources unimpaired for future generations is a high calling. It is one made the stronger through a series of federal court decisions and subsequent congressional acts that interpret our "conservation" mission as truly to "preserve and protect." This implicates non-native invasive species as clear threats to native natural resources and healthy functioning ecosystems. Further, invasive species are well known for their negative impacts upon cultural landscapes and structures.

The GEWA enabling legislation (January 23, 1930; 46 Statute 58) mandates administration and management of the monument "subject to the provisions of the Act of August 25, 1916…as amended." In other words, the park must manage according to the "preserve and protect" mandate of the interpreted NPS Organic Act, cited above.

The Government Performance and Results Act of 1993 (GPRA) requires Executive agencies and their bureaus to formulate and update strategic plans for program activities. The National Park Service completed such a document, September 30, 1997[1]. Several mission and long-term goals were established which directly require activities and planning for alien invasive vegetation management.

- NPS Mission Goal Ia: *Natural and cultural resources and associated values are protected, restored, and maintained in good condition and managed within their broader ecosystem and cultural context.*
- NPS Long-term Goals to be Achieved by September 30, 2002:
  Ia1. Disturbed Lands / Exotic Species -- 5% of targeted disturbed park lands, as of 1997, are restored, and 5% of priority targeted disturbances are contained.

[1] *National Park Service Strategic Plan: 1997.*

Ia2. Threatened and Endangered Species -- 25% of the 1997 identified park populations of federally listed threatened and endangered species with critical habitat on park lands or requiring NPS recovery actions have an improved status, and an additional 25% have stable populations.

Ia7. Cultural Landscapes -- 50% of the cultural landscapes on the Cultural Landscapes Inventory are in good condition.

GEWA completed their own **GPRA *Strategic Plan***, August 1997. One of the park mission goals states, "The Park's cultural and natural resources are preserved, protected, and maintained in good condition." A long-term goal that flows from that mission reads, "By 2002, 50% of natural resource inventories and plans are in place to insure regulatory requirements and resource protection." The invasive strategic plan herein strives to address these goals by assessing the invasive threat as well as recommending management actions to protect the resources of the park.

The February 3, 1999, **Executive Order on Invasive Species**, among other things, calls on federal agencies to prevent new invasive introductions, detect, monitor and control current infestations, and educate the public about invasive impacts and control methods.

> Federal Agency Duties. (a) Each Federal agency whose actions may affect the status of invasive species shall, to the extent practicable and permitted by law,
>
> (1) identify such actions;
>
> (2) ... (i) prevent the introduction of invasive species; (ii) detect and respond rapidly to and control populations of such species in a cost-effective and environmentally sound manner; (iii) monitor invasive species populations accurately and reliably; (iv) provide for restoration of native species and habitat conditions in ecosystems that have been invaded; (v) conduct research on invasive species and develop technologies to prevent introduction and provide for environmentally sound control of invasive species; and (vi) promote public education on invasive species and the means to address them; and
>
> (3) not authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive species...
>
> (EO#13112 - Invasive Species; 2/3/99; §2)

The Order therefore makes it a mandate not only to stem and control invasive species expansion but also to make positive confirmation that new infestations will not occur due to new federal projects.

Finally, the park's ***Resource Management Plan*** describes the need and intent to treat alien invasives. The narrative states, "Changes brought on by man-made and natural factors need to be identified in order to protect the natural and cultural resources of the park." And later, regarding Phragmites (common reed), one of the park's most worrisome invasives it says, "Continued monitoring and abatement is necessary to keep its spread in check until an eradication method can be found." The RMP appendix contains several project specific statements for eradication/suppression of invasive interlopers in the context of integrated pest management, protecting the historic area, and focused attention to Phragmites, honeysuckle, fescues, and other non-natives.

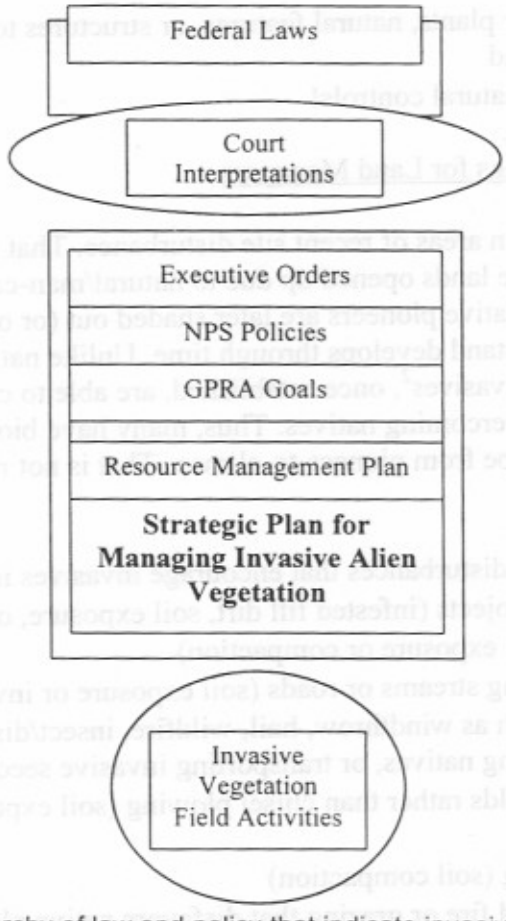

Figure 1. Illustrating the hierarchy of law and policy that indicate invasive species management.

Invasive Plants & Appropriate Action

Characteristics of Invasive Vegetation

Invasives have biological characteristics that allow them to rapidly invade and out-compete others for moisture, light, and nutrients. They do this through one or more of the following traits:

- High rates of photosynthesis
- Able to withstand high microsite temperatures
- Prolific reproductive capacity (short maturation to create seed; great seed producers, rapid vegetative spread rates, etc.)
- Rapid early growth and maturity (overshadowing others or expanding roots quickly)
- Highly successful seed germination, seed dispersal, and colonization
- Long lived seeds or reproductive structures in the soil
- Roots or rhizomes with large food reserve (resisting site impacts such as grazing, fire, insects, drought, etc.)
- Production of biological toxins that suppress the growth of other plants

- Ability to use other plants, natural features, or structures to overcome natives (shading out other plants) and
- Relatively free of natural controls!

Implications & Warnings for Land Managers

Alien invasives thrive in areas of recent site disturbance. That is characteristic of *pioneer species* as they colonize lands opened up due to natural/man-caused events. Typically, after filling an early niche, native pioneers are later shaded out (or otherwise replaced) by shade-tolerant species as the stand develops through time. Unlike native pioneer species, however, many alien invasives[2], once established, are able to create space for themselves by out-competing or overcoming natives. Thus, many have biological power to capture a position on the landscape from pioneer-to-climax. That is not natural either here nor in their native ranges.

Typical actions or land disturbances that encourage invasives include:

- Highway or road projects (infested fill dirt, soil exposure, or soil compaction[3])
- Utility projects (soil exposure or compaction)
- Natural erosion along streams or roads (soil exposure or invasive seed transport)
- Natural disaster such as windthrow, hail, wildfire, insect/disease epidemics (opening forest stands, harming natives, or transporting invasive seed)
- Open plowing of fields rather than chisel plowing (soil exposure or subsequent erosion)
- Pedestrian trampling (soil compaction)
- Timing of prescribed fire or grazing that disfavors native plant growth or reproduction
- Herbicide uses that either disfavors natives or opens the site to invaders.

Establishing a Program of Invasive Controls

Based on the biological and vectoring factors at play, as well as integrated pest management methodologies, the key elements of alien invasive control includes the following.

(1) Identify and rank pest species. Since eliminating all non-native vegetation is virtually impossible, the Park must distinguish the most aggressive (invasive) and choose which should be dealt with on a priority basis. (Typically, non-native invasives cannot be tolerated at even low levels due to their ability to quickly expand and dominate native sites.)
(2) Identify natural and cultural areas that need special or early protection due to their significance or sensitivity. Meld these zonal inputs into the overall priority system.
(3) Identify vectors of potential invasive introductions (as the subsection above) and minimize those potentials.

[2] Even those alien invasives that resemble native pioneers, and are phased out by shade-tolerant species, pose environmental risk by taking the place of natives during their land tenure.
[3] Soil compaction disfavors most species, not allowing root expansion. Only a hand full of species is well adapted to compacted ground, many of them alien.

(4) Set up field monitoring where site disturbance will or has already taken place for early detection.
(5) Treat prioritized invasives promptly as they appear.
(6) Follow up with monitoring and subsequent treatment to (a) assure eradication or control at the lowest levels possible and (b) learn from practices for increasing effectiveness and efficiency.

Appropriate Field Controls

Current benchmark, species-specific controls are described in the appendix for the identified invasives to date. Those descriptions are gathered from such sources as the Virginia Native Plant Society and the Southeastern Exotic Pest Plant Council -- both organizations of high repute.

Several broad categories of action are appropriate when treating alien invasives. One or a combination of approaches may be involved to effectively match the invasive challenge with effective suppression. General suppression/eradication approaches include the following.

- **Mechanical Control** -- Involves such treatments as hand pulling or hand cutting of specific plants, or mechanical mowing, harrowing or other treatments of plants en mass.
- **Prescribed Fire** -- Involves the use of ground fire for the purpose of killing or stressing invasive plants, killing seed on the ground, or as a preparation to open better access in areas choked with vines.
- **Biological Control** -- Includes the use of specific and nationally approved insects, diseases or animals to predate upon alien invasive vegetation.
- **Silvicultural/Agricultural Application** -- Includes the use of fast growing native vegetation to capture sites immediately after other suppressive methods have dealt with the primary invasive presence.
- **Chemical Application** -- Involves herbicide or fungicide applications to directly treat individual plants or groups en mass.

Many species when caught in the early stages of infestation may be successfully treated using mechanical methods. Common mullein (AKA flannel mullein) can be treated in this way. Unfortunately, as invasives expand their presence, the feasibility of handwork diminishes because of the sheer magnitude of the problem. However, when focusing on specific sites, hand pulling/cutting can still be a valuable tool in combination with other approaches. Indeed, many invasives are best treated with a combination of approaches.

George Washington Birthplace National Monument
Alien Invasive Vegetation Considerations

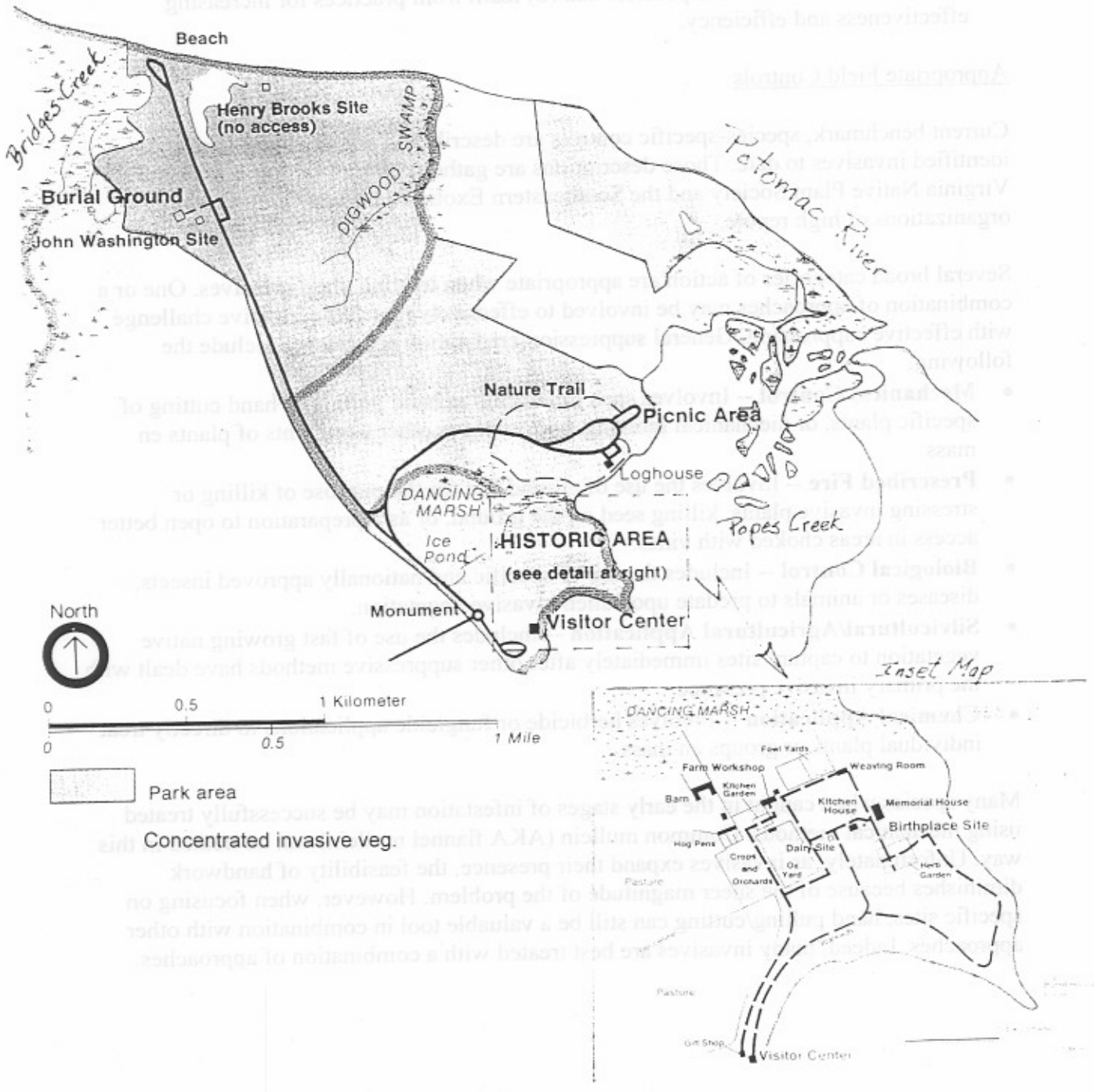

Figure 2. Map of GEWA indicating known concentrations of alien invasive vegetation.

Reconnaissance Summary

Rijk Moräwe and James Åkerson conducted field reconnaissance September 23, 1999, to determine the presence of alien invasives in the park. The following notes summarize their findings. As the fieldwork was done in autumn, early alien ephemerals may have been missed (such as garlic mustard and others). Additional reconnaissance should be conducted in the spring to supplement what is currently known and potentially expand the treatment plan noted in Appendix-A. Refer to Figure 2 for sketches of infestation epicenters within the Park.

Autumn olive (*Elaeagnus umbellata*). This shrub was found along the Potomac River and forest edge of the northeastern property.

Chinese lespedeza (*Lespedeza cuneata*). Lespedeza was found along the Potomac River shore and sandy bars above the river.

Common mullein (*Verbascum phlomoides*). This tall (3-6') stalked plant was observed in the garden plot and elsewhere. It can quickly increase from a few individuals to hundreds in an area within a few seasons.

English ivy (*Hedera helix*). Ivy was along the ground and climbing several trees along Popes Creek near the site of the old pedestrian bridge crossing.

Japanese honeysuckle (*Lonicera japonica*). This vine is scattered within the forest and forest/field edge in several locations.

Multiflora rose (*Rosa multiflora*). This pernicious rose was spotted along Popes Creek trail north of the visitor center. Rijk believes it is found elsewhere in forested portions of the park.

Orchard grass (*Dactylis glomerata*). Orchard grass was spotted in the fields along the paved road heading to the John Washington site and beach.

Periwinkle (*Vinca minor*). Along the Popes Creek bank north of the visitor center and park housing area, this low ground cover effectively keeps out natives where it forms dense mats.

Phragmites (*Phragmites australis*). This tall (4-7') stalked grass is present along the Potomac River shoreline and on several Popes Creek islands. It completely engulfs many sites, allowing no other species.

Princess tree (*Paulownia tomentosa*). Just a very few individuals were spotted along the paved road heading to the John Washington site and beach and around the park housing area.

Tall fescue (*Festuca elatior*). Fescue grass was spotted in the fields along the paved road heading to the John Washington site and beach and surrounding the maintenance yard.

Analysis of Alien Threats

Current Infestations

The current alien invasives at GEWA were prioritized using a system outlined in the *Handbook for Ranking Exotic Plants for Management and Control* by Hiebert and Stubbendieck (1993). The method assesses each species according to its environmental threat potential and its current control/eradication potential. The resulting plot of species values on a four-quadrant grid allows easy comparison. The first priority for treatment are those invasives which have a high environmental threat but which are easily controlled. The second priority includes high threats but lesser control potentials. The third have lesser threats and easier control potentials, while the lowest priority has lesser threats coupled with lesser control potentials.

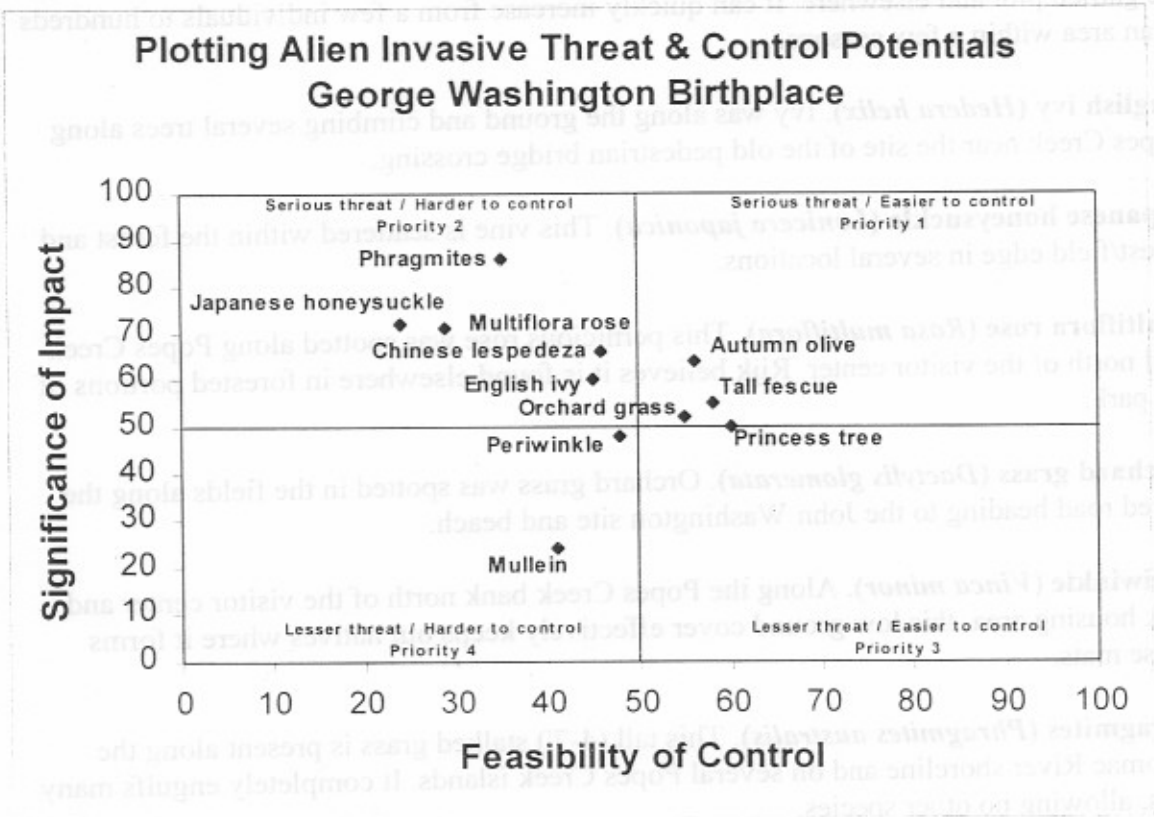

Figure 3. Ranking invasive vegetation at George Washington Birthplace National Monument.

The ranking of known invasives was as follows:

Priority 1
- Autumn olive
- Tall fescue
- Orchard grass

Priority 2
- Phragmites
- Chinese lespedeza
- English ivy
- Multiflora rose
- Japanese honeysuckle

Priority 3
- Princess tree

Priority 4
- Periwinkle
- Mullein

Table 1. Summary of threat & control potentials (alphabetical)

Common / Species names	Impact Potential	Control Potential	Urgency
Autumn olive (*Elaeagnus umbellata*)	64	56	High
Chinese lespedeza (*Lespedeza cuneata*)	66	46	Medium
Common mullein (*Verbascum phlomoides*)	24	41	Medium
English ivy (*Hedera helix*)	60	45	Medium
Japanese honeysuckle (*Lonicera japonica*)	72	24	High
Multiflora rose (*Rosa multiflora*)	71	29	High
Orchard grass (*Dactylis glomerata*)	52	55	Medium
Periwinkle (*Vinca minor*)	48	48	Low
Phragmites (*Phragmites australis*)	86	35	High
Princess tree (*Paulownia tomentosa*)	50	60	High
Tall fescue (*Festuca elatior*)	55	58	Medium

Zones of Protection

Due to natural and cultural resource considerations, the following areas require early detection and protection from non-native invasive vegetation.

Zone/Area	Value(s) at Stake	Relative Urgency
Wetlands	Native ecosystems & habitats	High
Grasslands	Wildlife & species diversity	High/moderate
Forests	Wildlife & species diversity	Moderate
Aquatic	Water quality (surface & ground water)	Moderate
Viewsheds	Presentation of a 17th-18th Century cultural landscape	Moderate
Archeological sites	Archaeological remains	Moderate/low – no current threat
Berms and ditches	Cultural landscape	Moderate/low – no current threat
Farm	Browse value & animal health	Moderate/low
All other areas	Park status: preserve/protect	Moderate/low

Species Watch List.

Though dozens of invasives could potentially infest the park, the following species are known to be in the coast plain/tidewater region and are particularly worrisome due to their environmental impacts. Both formal and informal monitoring should be done to detect their entry followed by early suppression actions.

Common Name	Latin Name	Appearance Comments
Purple loosestrife	*Lythrum salicaria*	Herbaceous perennial of 4-10' found in wetlands. Flower spikes of magenta with 5-7 petals. See Peterson, p. 224.
Oriental bittersweet	*Celastrus orbiculatus*	Climbing vine without prickles of forest and edge. Deciduous oval-shaped leaves are red/orange/yellow berries in fall. See Gleason & Cronquist, p. 328.
Mile-a-minute	*Polygonum perfoliatum*	Climbing vine **with** prickles of forest and edge. Bright green triangular leaves with saucer-shaped sheath at the base of each leaf. Fleshy blue berries. See Gleason & Cronquist, p. 138.
Kudzu	*Pueraria lobata*	Climbing vine without prickles of forest and field. Three-lobed, dark green leaves. Elongated purple flowers with a fragrance reminiscent of grapes. See Gleason & Cronquist, p. 305.
Johnson grass	*Sorghum halepense*	Tall grass (4-8') of upland fields. Its rhizomes resist control efforts and cause vegetative spread. Reddish-brown seeds are on loosely branched tops. See Gleason & Cronquist, p. 815.
Garlic mustard	*Alliaria petiolata*	Upright plant of uplands present in spring to early summer. Leaves smell of garlic/onion, and are simple triangular to heart-shaped, deeply toothed. See Peterson, p. 86.
Spotted knapweed	*Cetaurea maculosa*	Wiry-stemmed upright plant. Deeply clefted leaves with pink to purple flowers. Flower bracts with fringed black triangular tip. See Peterson, p. 306.

Canada thistle	*Cirsium arvense*	Hairless stems, much branched, with many flower/seed heads (heads only 1/2-3/4"). See Peterson, p. 304.
Bull thistle	*Cirsium vulgare*	Both bull and musk thistle (below) have spined wings along the entire stem. Large usually solitary flowers. Bull is 2-6' tall, with upright flowers. See Peterson, p. 302.
Musk thistle	*Carduus nutans*	As above, but 1-3' tall and with nodding flowers. See Peterson, p. 302.

Invasive Monitoring

A set of field and forest monitoring plots shall be established and remeasured over time to determine current and trending alien invasive species levels. The focus shall not be to accommodate research, but rather to gather operations information on both infestation-specific and parkwide levels to assist suppression planning. To accomplish this, the parkwide monitoring effort will focus on (1) forest/field edges, (2) fields, (3) streamsides, and (4) deep forest settings. Survey/monitoring will be established in each of those stratifications as well as major infestation treatment sites. Photographic points will be created at each treatment site to supplement the field data. While annual monitoring is appropriate for treatment sites, the parkwide plots may be on a 5-year cycle unless other factors indicate increased need for remeasurement.

Refer to the appendix for the monitoring protocols.

Program Implementation

Once approved, this Plan will guide the approach and implementation of invasive vegetation control in the Park. The primary responsibility for directing and coordinating the program lies with the Resource Management Specialist. The Virginia Invasive Vegetation Management Team (VIVMT)[4] will provide early technical expertise and labor during its period of NRPP support. However, since the VIVMT program is not permanently funded at this time, GEWA will continue the program under available park-base and grant-based funding using the protocols and the treatment schedule established herein with amendments as appropriate.

Consolidated Treatment Schedule

Refer to "Appendix-A – Treatment Schedule" for the prioritized listing of intended treatments. The schedule melds together the zonal and species considerations discussed above. It is placed in the appendix to facilitate easy updating as work is accomplished and

[4] VIVMT is currently funded by an NRPP grant for the fiscal years 2000/2001. Its commission is to help eight parks establish non-native invasive vegetation management programs. Cooperating parks include APCO, BOWA, COLO, FRSP, PETE, RICH and SHEN.

new information is gathered. New project sites will be added to the list within the guidance of this Plan as added field information is gathered and appropriately evaluated.

References

Alien Plant Working Group. 1999. Plant Conservation Alliance, Bureau of Land Management, Washington, DC. Contact person, Olivia Kwong. Phone (202) 452-0392. Website currently found at http://www.nps.gov/plants/alien/.

Gleason, Henry A. and Arthur Cronquist. 1991. *Manual of vascular plants of Northeastern United States and adjacent Canada*. Second ed. The New York Botanical Garden, Bronx, NY. 910 pp.

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Peterson, Roger Tory and Margaret McKenny. 1996. *A field guide to wildflowers of northeastern and northcentral North America*. Houghton Mifflin Company, Boston & New York. 420 pp.

SE-EPPC. Southeast Exotic Pest Plant Council. President Kristine Johnson, NPS-GRSM. Phone: (423) 436-1707. Website currently found at http://www.webriver.com/tn-eppc/.

U.S. Congress. 1930. *An Act authorising an appropriation for improvements upon the government-owned land at Wakefield, Westmoreland County, Virginia, the birthplace of George Washington*. Approved January 23, 1930. 46 Statute 56.

Virginia Native Plant Society. Virginia Department of Conservation & Recreation, Virginia Natural Heritage Program, Richmond, VA. Phone: (804) 786-7951. Currently found on the web at http://www.state.va.us/~dcr/vaher.html.

Appendices

Appendix A -- Treatment Schedule

Appendix B -- Treatment Protocols

Appendix C -- Alien Threat/Control Ranking Sheets

Appendix D -- Monitoring Protocols

Appendix E -- NEPA/NHPA Compliance

Appendix A -- Treatment Schedule

Prioritized Treatment Schedule – GEWA

Location / Site Code	Alien Invasive Vegetation	Acres	Special Considerations	Best Time (Season or month)	Status (Initial or follow-up)
Potomac dune-AO EX-ELAUMB-001	Autumn olive	0.25	Ecosystem health	Basal app - anytime not frozen	I-2000
Pine plantation-AO EX-ELAUMB-002	Autumn olive	~~3.5~~ >10	Ecosystem health; forest health	Basal app - anytime not frozen	I-2000
Longwood-P EX-PHRAUS-001	Phragmites	3-4	Ecosystem health; wetlands health	Basal app – not frozen at low water	I-2000
Potomac sandbar-P EX-PHRAUS-002	Phragmites	0.5	Ecosystem health; wetlands health	Basal app – not frozen at low water	I-2000
Marsh isles-P EX-PHRAUS-003	Phragmites	0.5	Ecosystem health; wetlands health	Basal app – not frozen at low water	I-2000
Bridges Cr.-P EX-PHRAUS-004	Phragmites		Ecosystem health; wetlands health	Basal app – not frozen at low water	I-2000
Digwood swamp grassland-TF/OG EX-FESELA-001	Tall fescue Orchard gr.	5.0	Native ecosystems; ecosystem health; stand health	Foliar app – 65°+ F.	I-2000
Lower hist. area at Dancing Marsh-I EX-HEDHEL-001	English ivy	0.125	Native ecosystems; ecosystem health; stand health	Cut/pull any-time; basal app - 65°+ F.	I-2000
Hist. Area-V EX-VINMIN-001	Vinca minor	0.25	Ecosystem health; stand health	Cut/spray - spring	I-2000
Housing area-V EX-VINMIN-002	Vinca minor	0.125	Ecosystem health; stand health	Cut/spray - spring	I-2000
Hist. Garden-M EX-VERPHL-001	Common mullein	0.05	Invasive vectoring	Pull – anytime Foliar app – not frozen	I-2000
Scattered mullein-M EX-VERPHL-002	Common mullein	Scat.	Ecosystem health; forest/grassland health	Pull – anytime Foliar app – not frozen	I-2000
Scattered Japanese honeysuckle-HS EX-LONJAP-001	Japanese honeysuckle	Scat.	Ecosystem health; forest health	Foliar app – late fall	I-2000
Pine pond-MR EX-ROSMUL-001	Multiflora rose	0.05	Ecosystem health; forest health	Cut stump & spray app – spring - fall	I-2000

Location / Site Code	Alien Invasive Vegetation	Acres	Special Considerations	Best Time (Season or month)	Status (Initial or follow-up)
Scattered multiflora rose-MS EX-ROSMUL-002	Multiflora rose	Scat.	Ecosystem health; forest health	Cut stump & spray app – spring - fall	I-2000
THST - TOH	TOH	2			
THST - Honey	J. H.				
THST - Privet	Privet				

Appendix B -- Treatment Protocols

[Taken from the *Tennessee Exotic Plant Management Manual*. c. 1997. Southeast Exotic Pest Plant Council, Nashville, TN. Pp. 119. Accessed on the web at http://webriver.com/tn-eppc/manual/elaeag.htm.]

Autumn Olive

Elaeagnus umbellata (Thunb.)

Autumn olive is an introduced, fast-growing woody shrub in the Elaeagnaceae (Oleaster) family. Used extensively for wildlife habitat, strip mine revegetation, and shelter belts, autumn olive thrives in disturbed areas open to full sun. It is adaptive, competitive, and vigorous, especially on open, sunny sites and it produces abundant fruit crops.

Height: Autumn olive grows to a height of 6 m (20 ft). Its growth habit is bushy with a spreading crown.

Leaves: Deciduous leaves are alternate, short-petioled, elliptic to ovate, and oblong. They are glabrous, dark green above, conspicuously silvery beneath.

Twigs: The silvery or golden brown twigs often have prominent spines.

Flowers: Fragrant flowers are axillary, pedicellate, tube-shaped, and yellowish-white, with 4 sepals and 4 stamens. Blooms May-June.

Fruit: Fruits are abundant, juicy, round drupes up to 1 cm (0.4 in) in length. Silvery fruit turns to red as it matures and is speckled with brown to silvery scales. Matures September-October.

Life History

Elaeagnus spp. are among the few non-legumes that fix nitrogen in the soil by means of bacterial root nodes. Plants flower and develop fruits annually after reaching three years of age. An individual can produce up to 3.6 kg (8 lbs.) of fruit that are consumed and spread by birds and small mammals.

Origin and Distribution

Autumn olive was introduced into the United States in 1830 from China and Japan. It has been actively promoted by state and federal agencies for shelter belts, erosion control,

strip mine reclamation, wildlife habitat, and was widely marketed as an ornamental. The shrub has now become naturalized in suitable habitats scattered throughout the eastern and Midwestern U.S.

Similar Species

Several other Elaeagnus species have become naturalized in the U.S. A native species E. commutata (Bernh.) is found in the far northern states and Canada. Minnie bush (Menziesia pilosa [Michx. ex Lam] Jussieu ex Pers.), a high elevation, southern Appalachian endemic, is somewhat similar but has glands, not scales, on the midrib.

Habitat

Autumn olive grows well in disturbed areas, open fields, margins of forests, roadsides, and clearings. Being tolerant of drought, it does not grow well in wet sites. It is intolerant of shade and will not invade areas of dense forest. Because the fruits are eaten by a variety of wildlife, the seeds may be distributed into forest openings or open woodlands.

Management Recommendations

Mechanical Controls

Cutting: Cut trees at ground level with power or manual saws. Cutting is most effective when trees have begun to flower to prevent seed production. Because autumn olive spreads by suckering, resprouts are common after treatment. Cutting is an initial control measure, and success will require either an herbicidal control or repeated cutting of resprouts.

Girdling: Use this method on large trees where the use of herbicides is not practical. Using a hand-axe, make a cut through the bark encircling the base of the tree, approximately 15 cm (6 in) above the ground. Be sure that the cut goes well into or below the cambium layer. This method will kill the top of the tree but resprouts are common, and may require follow-up treatments for several years until roots are exhausted.

Hand Pulling: Autumn olive is effectively controlled by manual removal of young seedlings. Plants should be pulled as soon as they are large enough to grasp, but before they produce seeds. Seedlings are best pulled after a rain when the soil is loose. The entire root must be removed since broken fragments may resprout.

Herbicidal Controls

Foliar Spray Method: This method should be considered for large thickets of autumn olive seedlings where risk to non-target species is minimal. Air temperature should be above 65°F to ensure absorption of herbicides.

Glyphosate: Apply a 2% solution of glyphosate and water plus a 0.5% non-ionic surfactant to thoroughly wet all leaves. Use a low pressure and coarse spray pat-tern to reduce spray drift damage to non-target species. Glyphosate is a non-selective systemic herbicide that may kill non-target, partially-sprayed plants.

Triclopyr: Apply a 2% solution of triclopyr and water plus a 0.5% non-ionic surfactant to thoroughly wet all leaves. Use a low pressure and coarse spray pattern to reduce spray drift damage to non-target species. Triclopyr is a selective herbicide for broadleaf species. In areas where desirable grasses are growing under or around autumn olive, triclopyr can be used without non-target damage.

Cut Stump Method: This control method should be considered when treating individual trees or where the presence of desirable species preclude foliar application. Stump treatments can be used as long as the ground is not frozen.

Glyphosate: Horizontally cut stems at or near ground level. Immediately apply a 50% solution of glyphosate and water to the cut stump, covering the outer 20% of the stump.

Triclopyr: Horizontally cut stems at or near ground level. Immediately apply a 50% solution of triclopyr and water to the cut stump, covering the outer 20% of the stump.

Basal Bark Method: This method is effective throughout the year as long as the ground is not frozen. Apply a mixture of 25% triclopyr and 75% horticultural oil to the basal parts of the tree to a height of 30-38 cm (12-15 in) from the ground. Thorough wetting is necessary for good control; spray until run-off is noticeable at the ground line.

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[Taken from the Native Plant Conservation Alliance website, Alien Plant Working Group. June 25, 1998. Accessed on the web at http://www.nps.gov/plants/alien/fact/lecu1.htm.]

Chinese Lespedeza

Lespedeza cuneata (Dumont) G. Don

[Chinese Lespedeza] NATIVE RANGE: Eastern Asia

DESCRIPTION: Chinese lespedeza is a warm season, perennial herb in the pea family, or Fabaceae. It has an erect growth form, ranging from about 3 to 5½ feet in height, and leaves that alternate along the stem. Each leaf is divided into three smaller leaflets, about ½ to 1 inch long, which are narrowly oblong and pointed, with awl-shaped spines. Leaflets are covered with densely flattened hairs, giving a grayish-green or silvery appearance. Mature stems are somewhat woody and fibrous with sharp, stiff, flattened bristles. Violet to purple flowers emerge either singly or in clusters of 2-4, from the axils of the upper and median leaves.

ECOLOGICAL THREAT: Chinese lespedeza, sometimes called sericea lespedeza, is primarily a threat to open areas such as meadows, prairies, open woodlands, wetland borders and fields. Once it gains a foothold, it can crowd out native plants and develop an extensive seed bank in the soil, ensuring its long residence at a site. Established dense stands of lespedeza suppress native flora and its high tannin content makes it unpalatable to native wildlife as well as livestock.

DISTRIBUTION IN THE UNITED STATES: Chinese lespedeza is now found throughout the U.S.

HABITAT IN THE UNITED STATES: Chinese lespedeza can grow in a variety of habitats including severely eroded sterile soils. It will invade open woodlands, fields, prairies, borders of ponds and swamps, meadows, and open disturbed ground, but is intolerant of shade.

BACKGROUND: Chinese lespedeza is native to eastern Asia and was first introduced to the southern United States. Widespread use of lespedeza by federal and state agencies for bank stabilization, soil improvement, wildlife and forage and cover, and hay facilitated its spread throughout the eastern United States.

METHODS OF REPRODUCTION & DISPERSAL: Chinese lespedeza begins growth from root crown buds at the base of last year's stem. The flowers begin to develop in late July and continue through October. Within the Lespedeza genus there are no specialized structures for seed dispersal. Dispersal is aided by animals consuming the fruits and passing the seeds. A study on natural populations found that several species of Lespedeza comprise 1.5% to 86.8% of the annual diet of bobwhite quail in the southeastern U.S. Autumn dispersal is aided by the haying of infested fields.

Scarification is necessary for the germination of lespedeza seeds. Mature seeds of this genus remain viable for up to twenty years; one study found a germination rate of 60% after cold storage for 55 years. Seedlings may represent only 1% of the seeds actually available in the soil.

CURRENT MANAGEMENT APPROACHES: Mechanical and chemical methods are the most effective options currently available for Chinese lespedeza. Hand pulling is impractical due to lespedeza's extensive perennial root system. Mowing plants in the flower bud stage for two or three consecutive years may reduce the vigor of lespedeza stands and control further spread. Plants should be cut as low to the ground as possible and impact to adjacent native plants should be minimized as much as possible.

Since root reserves increase up to the flower bud stage, all herbicide treatments should be completed in early to mid summer. The addition of a non-ionic surfactant at a concentration of 0.5% improves the effectiveness of foliar treatments. Triclopyr and clopyralid have been shown to be effective in controlling Chinese lespedeza. A 2% solution Triclopyr or 0.5% solution of clopyralid thoroughly mixed with water is effective during the vegetative stage prior to branching or during flowering. Treatments should cover the leaves and stems of plants to the point of runoff. These herbicides are not labeled for use in wet areas or adjacent to streams. On wet sites a 2% solution of glyphosate is effective from last June until seed set.

For more information on the management of Chinese lespedeza, please contact:

Kris Johnson, Great Smoky Mountains National Park, Gatlinburg, TN (kris_johnson@nps.gov)

SUGGESTED ALTERNATIVE PLANTS: Although not a popular ornamental in the U.S., some suitable native alternatives for Sericea lespedeza include butterflyweed (Asclepias tuberosa), joe-pye weed (Eupatorium dubium), black-eyed Susan (Rudbeckia fulgida), big blue stem (Andropogon gerardii), or Indian grass (Sorghastrum nutans). Contact your state native plant society for further suggestions for plants native to your particular locale.

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[Taken from the Native Plant Conservation Alliance website, Alien Plant Working Group. August 19, 1998. Accessed on the web at http://www.nps.gov/plants/alien/fact/vethl.htm.]

Common Mullein

Verbascum thapsus L.

[Common Mullein] NATIVE RANGE: Europe and Asia

DESCRIPTION: Common mullein, also known as wooly mullein, is a erect herb in the figwort family, or Scrophulariaceae. First year mullein plants are low-growing rosettes of bluish gray-green, feltlike leaves that range from 4-12 inches in length and 1-5 inches in width. Mature flowering plants are produced the second year, and grow to 5 to 10 feet in height, including the conspicuous flowering stalk. The five-petaled yellow flowers are arranged in a leafy spike and bloom a few at a time from June-August. Leaves alternate along the flowering stalks and are much larger toward the base of the plant. The tiny seeds are pitted and rough with wavy ridges and deep grooves and can germinate after lying dormant in the soil for several decades.

ECOLOGICAL THREAT: Common mullein threatens natural meadows and forest openings, where it adapts easily to a wide variety of site conditions. Once established, it grows more vigorously than many native herbs and shrubs, and its growth can overtake a site in fairly short order. Common mullein is a prolific seeder and its seeds last a very long time in the soil. An established population of common mullein can be extremely difficult to eradicate.

DISTRIBUTION IN THE UNITED STATES: Common mullein was first introduced into the U.S. in the mid-1700's, where it was used as a piscicide, or fish poison, in Virginia. It quickly spread throughout the U.S. and is well established throughout the eastern states. Records show that it was first described in Michigan in 1839 and on the Pacific coast in 1876, probably due to multiple introductions as a medicinal herb.

HABITAT IN THE UNITED STATES: Common mullein can be found where mean annual precipitation is greater than 3-6 inches and the growing season lasts for a minimum of 140 days. Intolerant of shade, mullein will grow in almost any open area including natural meadows and forest openings as well as neglected pastures, road cuts, industrial areas. Common mullein prefers, but is not limited to, dry sandy soils.

BACKGROUND: Common mullein is a monocarpic perennial (i.e., takes two or more years to flower and die). Brought over from Europe by settlers, it was used as a medicinal herb, as a remedy for coughs and diarrhea and a respiratory stimulant for the lungs when smoked. A methanol extract from common mullein has been used as an insecticide for mosquito larvae.

METHODS OF REPRODUCTION & DISPERSAL: During the first summer after germination mullein produces a tap root and a rosette of leaves. During this vegetative stage, the rosette increases in size during the growing season until low temperatures arrest growth sometime during the autumn and winter. Beginning the next spring, second year plants bolt into maturity, flower, produce seed during the summer, and then die, completing the plant's normal life cycle. Flowers mature from the base to the tip of the stalk. The length of the flowering period is a function of stalk height; longer stalks can continue to flower into early October. It is estimated that a single plant can produce 100,000-180,000 seeds which may remain viable for more than 100 years. The seeds are dispersed mechanically near the parent plant during the autumn and winter. Seeds at or near the surface are more likely to germinate.

CURRENT MANAGEMENT APPROACHES: Although common mullein can be very difficult to eradicate, there are a variety of management methods available, depending on the particular situation. Because mullein seedling emergence is dependent on the presence of bare ground, sowing sites with early successional native grasses or other plants may decrease seed germination and the chance of successful emergence of mullein seedlings.

Mullein plants are easily hand pulled on loose soils due to relatively shallow tap roots. This is an extremely effective method of reducing populations and seed productivity, especially if plant is pulled before seed set. If blooms or seed capsules are present, reproductive structures should be removed, bagged, and properly disposed of in a sanitary landfill. Care should be taken, however, to minimize soil disturbance since loose soil will facilitate mullein seed germination.

There are two insects that have possible biological control implications for mullein. A European curculionid weevil (Gymnaetron tetrum), determined by the U.S. Department of Agriculture to be specific to mullein, has been introduced to North America. The weevil larvae matures in the seed capsules and can destroy up to 50% of the seeds. Another agent, the mullein moth (Cucullia verbasci) has been tested in

the U.S. and is considered to be a relatively safe control agent because of its consistent feeding and development on mullein species. Although tests showed limited feeding on other native species, the larvae did not survive significantly longer than those individuals tested in the absence of food.

Release of biological controls into natural environments is always experimental and should be entered into only after full and careful consideration of potential non-target species impacts. Once released into nature, biological control agents are difficult if not impossible to control.

For situations where hand-pulling of plants is not practical or safe, for example, on very steep slopes where hand pulling is dangerous or would cause significant soil disturbance, herbicidal control is an effective option. Apply a 2% solution of glyphosate (e.g., Roundup) or triclopyr (Garlon) and water plus a non-ionic surfactant, using a tank or backpack sprayer to thoroughly cover all leaves. Do not apply so heavily that the herbicide drips off the leaf surface. Use caution as glyphosate is a non-selective herbicide that may kill desirable plants even if partially contacted by spray. Triclopyr is selective to broadleaf plants and is a better choice if native or other desirable grasses are present. For some sites, applications can be made during the early spring when most other non-target vegetation is dormant. Refer to the pesticide manufacturers' label for specific information and restrictions regarding herbicide use.

USE PESTICIDES WISELY: ALWAYS READ THE ENTIRE PESTICIDE LABEL CAREFULLY, FOLLOW ALL MIXING AND APPLICATION INSTRUCTIONS AND WEAR ALL RECOMMENDED PERSONAL PROTECTIVE GEAR AND CLOTHING. CONTACT YOUR STATE DEPARTMENT OF AGRICULTURE FOR ANY ADDITIONAL PESTICIDE USE REQUIREMENTS, RESTRICTIONS OR RECOMMENDATIONS.

NOTICE: MENTION OF PESTICIDE PRODUCTS ON THIS WEB SITE DOES NOT CONSTITUTE ENDORSEMENT OF ANY MATERIAL.

For more information on the management of Common Mullein, please contact:

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SUGGESTED ALTERNATIVE PLANTS: Although not a popular ornamental, there are many excellent native plant alternatives for mullein that thrive in full sun and sandy soils. In the eastern U.S., common milkweed

(Asclepias syriaca), butterflyweed (Asclepias tuberosa), joe-pye weed (Eupatorium dubium), black-eyed Susan (Rudbeckia fulgida), and Ironweed (Vernonia noveboracensis), are just a few of the many selections. You may wish to contact your local native plant society for further suggestions.

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Native Plant Conservation Alliance, Alien Plant Working Group. August 19, 1998.

[Taken from the VA-Native Plant Society fact sheet on multiflora rose found on the web at http://www.state.va.us/~dcr/dnh/invphrag.htm.]

Common Reed

(Phragmites australis (Cav.) Trin. ex Steud)

Description

Common reed is a tall perennial wetland grass ranging in height from three to thirteen feet. Strong leathery horizontal shoots, called rhizomes, growing on or beneath the ground surface give rise to roots and tough vertical stalks. These stalks support broad sheath-type leaves that are one-half to two inches wide near the base, tapering to a point at the ends. The foliage is gray-green during the growing season, with purple-brown plumes appearing by late June. The plant turns tan in the fall and most leaves drop off, leaving only the plume-topped shoot. Big cordgrass (Spartina cynosuroides), a non-invasive species, is sometimes confused with common reed. It can be distinguished from common reed by its sparse flowering structure and long narrow leaves.

Habitat

Common reed thrives in sunny wetland habitats. It grows along drier borders and elevated areas of brackish and freshwater marshes and along riverbanks and lakeshores. The species is particularly prevalent in disturbed or polluted soils found along roadsides, ditches and dredged areas.

Distribution

Found throughout the temperate regions of North America, common reed is widespread in eastern Virginia and also can be found in some western areas of the state. It is strongly suspected that a non-native, aggressive strain of the species was carried to North America in the early 20th century.

Life History

Common reed spreads to a new area by sprouting from a rhizome fragment or from seed. New upright stems grow from the rhizome each spring. Rhizomes spread horizontally in all directions during the growing season. Flowering begins in late June, and seeds are formed by August. In early autumn, food reserves move from leave and stems to the rhizome system. The leaves die and fall off, with only the dead brown vertical shoots remaining. The accumulation of dead leaves and stems, as well as the pervasive rhizome system, prohibits the growth of desirable plant species.

Threats

Common reed has become a destructive weed in Virginia, quickly displacing desirable plants species such as wild rice, cattails, and native wetland orchids. Invasive stands of common reed eliminate diverse wetland plant communities, and provide little food or shelter for wildlife.

Prevention

Minimizing land disturbances and water pollution helps deter this invasive species. Land management practices that guard against erosion, sedimentation, fluctuating water levels and nutrient loading in wetlands are the best long-term protection.

Control

Once established, common reed is very difficult to completely eradicate. However, careful planning and long-term management can yield varying levels of control. Herbicide use in combination with burning has generally proven to be the most effective means of control, and results in minimal disturbance to wetlands. Only a biodegradable herbicide which is licensed for use in wetlands and non-toxic to animals can be sued. Because a healthy wetland ecosystem is generally resistant to invasive species, long-term control of common reed depends upon restoration of the health of the ecosystem.

For more information contact:

Virginia Native Plant Society
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Virginia Department of Conservation and Recreation
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[Taken from the VA-Native Plant Society fact sheet on Japanese honey-suckle found on the web at http://www.state.va.us/~dcr/dnh/invloni.htm]

Japanese Honeysuckle

(Lonicera japonica Thunberg)

Description

Japanese Honeysuckle is a trailing or twining woody vine that can grow to more than 30 feet in length. Young stems are often hairy; older stems are hollow with brownish bark that may peel off in shreds. The simple, opposite leaves are oval to oblong in shape and range from 1.5 to 3 inches in length. In much of Virginia, leaves of Japanese honeysuckle are semi-evergreen and may persist on vines year-round. The extremely fragrant, two-lipped flowers are borne in pairs in the axils of young branches and are produced throughout the summer. Flowers range from 1 to 2 inches in length and are white with a slight purple or pink tinge when young, changing to white or yellow with age. The fruit is a many-seeded, black, pulpy berry that matures in early autumn. Japanese honeysuckle is distinct from our two native honeysuckles, the trumpet honeysuckle (Lonicera sempervirens), and wild honeysuckle (Lonicera dioica). These natives both bear red to orange-red berries, and their uppermost pair of leaves is joined together.

Habitat

Japanese honeysuckle occurs primarily in disturbed habitats such as roadsides, trails, fence rows, abandoned fields and forest edges. It often invades native plant communities after natural or human induced disturbance such as logging, road building, floods, glaze and windstorms, or pest and disease outbreaks.

Distribution

Japanese honeysuckle is native to eastern Asia. Introduced to cultivation in 1862 on Long Island, Japanese honeysuckle is now widely naturalized in the eastern and central United States. Japanese

honeysuckle was, and in some areas still is, planted as an ornamental ground cover, for erosion control, and for wildlife food and habitat. In Virginia, Japanese honeysuckle is naturalized state wide, being most abundant in piedmont and coastal plain forests.

Threats

Where light levels are optimal, such as in forest edges, canopy gaps or under sparse, open forest, newly established Japanese honeysuckle vines grow and spread rapidly. Suppressed vines growing in dense shade, however, are capable of rapid growth and spread when light levels in a habitat are increased by disturbance. In forests, Japanese honeysuckle vines spread both vertically and horizontally by climbing up tree trunks and/or by trailing or clambering over the forest floor and associated vegetation. Trailing vines produce stolons which root when they contact soil, aiding the vegetative spread and persistence of the species.

Dense, strangling growths of Japanese honeysuckle can impact desirable vegetation by decreasing light availability within the habitat, depleting soil moisture and nutrients, or by toppling upright stems through the sheer weight of accumulated vines. Negative effects of Japanese honeysuckle invasion include development of malformed trunks in trees, suppression of plant growth, inhibition of regeneration in woody and herbaceous plants, and alteration of habitats used by native wildlife.

Control

Small populations can be controlled by careful hand-pulling, grubbing with a hoe or a shovel, and removal of trailing vines. In old fields and roadsides, twice yearly mowing can slow vegetative spread; however, due to vigorous resprouting, stem density may increase. In pine plantations or in fire-dependent natural communities, Japanese honeysuckle can be controlled by prescribed burning. Burning can greatly decrease the abundance of Japanese honeysuckle within a habitat and limit its spread for one or two growing seasons. Where prescribed burning or mowing are difficult or undesirable, Japanese honeysuckle may be treated with a glyphosate herbicide. Glyphosate is recommended because it is biodegradable and will begin to break down into harmless components on contact with the soil. However, it is nonselective and can affect all green vegetation. Therefore, it is best applied to the semi-evergreen leaves with a spray or wick applicator in late autumn when other vegetation is dormant but Japanese honeysuckle is still physiologically active. Reapplication may be necessary to treat plants missed during the initial treatment. To be safe and effective, herbicide use requires careful knowledge of the chemicals, appropriate concentrations, and the effective method and timing of their application. Consult a natural resource specialist for more information on herbicide use and prescribed burning techniques.

Suggested Alternatives

Some native alternatives to Japanese honeysuckle for use in home landscaping include trumpet creeper (Campsis radicans), Virginia creeper (Parthenocissus quinquefolia), and trumpet honeysuckle (Lonicera sempervirens). Wild ginger (Asarum canadensis) makes an excellent ground cover in shady areas. All these species are easy to cultivate, have wildlife and aesthetic value, and can generally be

obtained from commercial sources or propagated by wild-collected seeds or cuttings.

Written by Dr. Charles E. Williams, Department of Biology, Clarion University

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w/approval by R. Morrow.

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English Ivy

Hedera helix L.

NATIVE RANGE: Europe, western Asia, and northern Africa

DESCRIPTION: English ivy is an evergreen climbing vine in the ginseng family (Araliaceae). Vines attach to the bark of trees, brickwork, and other surfaces by way of numerous, small rootlike structures, which exude a gluelike substance. Older vines are known to reach a foot in diameter. Leaves are dark green, waxy, somewhat leathery, and are arranged alternately along the stem. English ivy has many recognized leaf forms, the most common being a 3-lobed leaf with a heart-shaped base. Leaves in full sun are often unlobed, oval and have wedge-shaped bases. Umbrella-like clusters of small, greenish-white flowers appear in the fall if sufficient sunlight is available. Fruits mature in Spring and are black with a fleshy outer covering enclosing one to a few hard, stone-like seeds.

NOTE: Compounds in English ivy are somewhat toxic and include glycosides that cause vomiting, diarrhea, nervous conditions and dermatitis in sensitive individuals. This characteristic helps ensure spread of the seeds by many native songbirds that are attracted to the black berries in Spring when other food sources are limited.

ECOLOGICAL THREAT: English ivy is an aggressive invader that threatens all vegetation levels of forested and open areas, growing along the ground as well as into the forest canopy. The dense growth and abundant leaves, which spring from the stems like small umbrellas, form a thick canopy just above the ground, and prevent sunlight from reaching other plants. Similarly, vines climbing up tree trunks spread out and surround branches and twigs, preventing most of the sunlight from reaching the leaves of the host tree. Loss of host tree vigor, evident within a few years, is followed by death a few years later. The added weight of vines makes infested trees susceptible to blow-over during storms. English ivy also serves as a reservoir for bacterial leaf scorch (Xylella fastidiosa), a plant pathogen that is harmful to native trees such as elms, oaks, and maples. English ivy is a popular plant, recommended by Cooperative Extension offices for use as a low maintenance alternative to lawns. It is widely used by homeowners, horticulturists, landscape contractors, parks departments and others desiring a fast-growing, low maintenance, evergreen groundcover. Once established at a site, English ivy can be expected to move beyond its intended borders into neighboring yards, parks and other lands, either by vegetative means or by seed.

DISTRIBUTION IN THE UNITED STATES: English ivy occurs in at least 26 states and the District of Columbia, where it is one of the most abundant and widespread invasive plants. Click here to see a distribution map.

HABITAT IN THE UNITED STATES: English ivy infests woodlands, forest edges, fields, hedgerows, coastal areas, salt marsh edges, and other upland areas, especially where some soil moisture is present. It does not grow well in extremely wet conditions and is often associated with some form of land disturbance, either human-caused or natural.

BACKGROUND: English ivy was probably first introduced to the US by European immigrants and is widely sold as an ornamental plant for landscapes throughout the US.

METHODS OF REPRODUCTION & DISPERSAL: English ivy reproduces vegetatively and by seed, which is dispersed to new areas primarily by birds, including English house sparrows, European starlings, robins, Stellar jays, and cedar waxwings. New plants grow easily from cuttings or from stems making contact with the soil.

CURRENT MANAGEMENT APPROACHES: Several effective methods of control are available for English ivy, including chemical and non-chemical, depending on the extent of the infestation, the amount of native vegetation on-site, and available time and labor.

Manual and Mechanical. Vines growing as groundcover can be pulled up by hand, with some difficulty, and left on-site or bagged and disposed of as trash. Vines climbing up into the tree canopy are more difficult to manage. First, vines should be cut at a comfortable height to kill upper portions and relieve the tree canopy. A large screw driver or forked garden tool can be used to pry and snap the vines away from the tree trunks. Vines can be cut using an axe or with more difficulty, using a pruning saw. Rooted portions of vines will remain alive and should be pulled, and repeatedly cut. Because cutting will likely promote further growth from the base, vigilance is required to ensure long term control.

Chemical. The systemic herbicide triclopyr (e.g., Garlon) is absorbed into plant tissues and carried to the roots, effectively killing the entire plant in place.
Foliar applications: From summer to fall, apply a 2.5% mixture of triclopyr amine (Garlon 3A) in water to the leaves or cut first, allow to regrow, and apply the same mix to new foliage. Herbicide will also be absorbed through the stem bark for additional effect.
Basal bark applications: A higher rate (15-30%) of triclopyr ester (Garlon 4) may also be applied to stems of vines growing up trees but there is a possibility that the herbicide will be absorbed into the host tree, depending on the thickness of the host tree's bark and the penetration of English ivy rootlets.
Because English ivy is an evergreen vine, and remains active during the winter, herbicide applications can be made to it any time of year as long as temperatures are above 55 or 60 degrees Fahrenheit for a few days. Fall and winter applications will avoid or minimize impacts to many native plant species. Repeat herbicidal treatments are likely to be needed and followup monitoring should be conducted to evaluate the success of treatments. Herbicidal contact with desirable plants should always be avoided. In areas where spring wildflowers or other native plants are interspersed, application of herbicides should be conducted prior to their emergence, or delayed until they have died back

Biological control. There are no biological controls currently available for English ivy.

USE PESTICIDES WISELY: ALWAYS READ THE ENTIRE PESTICIDE LABEL CAREFULLY, FOLLOW ALL MIXING AND APPLICATION INSTRUCTIONS AND WEAR ALL RECOMMENDED PERSONAL PROTECTIVE GEAR AND CLOTHING. CONTACT YOUR STATE DEPARTMENT OF AGRICULTURE FOR ANY ADDITIONAL PESTICIDE USE REQUIREMENTS, RESTRICTIONS OR RECOMMENDATIONS.

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For more information on the management of English ivy, please contact:

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Sue Salmons, Rock Creek Park, Washington, D.C., sue_salmons@nps.gov
Jil Swearingen, National Park Service, Washington, D.C., jil_swearingen@nps.gov

SUGGESTED ALTERNATIVE PLANTS: Attractive native vines are available that provide nectar for

hummingbirds, butterflies, and other insects, serve as host plants for native insects, and provide food for many wildlife species. Vines native to the eastern U.S. include Allegheny pachysandra (Pachysandra procumbens), American or common bittersweet (Celastrus scandens), trumpet creeper (Campsis radicans), Virginia creeper (Parthenocissus quinquefolia), passionflower vine (Passiflora lutea), Dutchman's pipe (Aristolochia macrophylla), and native wisteria* (Wisteria frutescens).

* If you wish to plant wisteria, make certain that it is the native species. Two commonly planted ornamental wisterias, Chinese wisteria (Wisteria sinensis) and Japanese wisteria (Wisteria floribunda), are exotic and aggressive invaders. Please consult the native plant society in your state for more information on species native to your particular area.

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PHOTOGRAPHS:

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COMMON NAMES | APWG HOME PAGE

Comments, suggestions, and questions about the website should be directed to the webmaster.

http://www.nps.gov/plants/alien/fact/hehe1.htm
Last updated: 12/4/00

[Taken from the VA-Native Plant Society fact sheet on multiflora rose found on the web at http://www.state.va.us/~dcr/dnh/invmulti.htm.]

Multiflora Rose

(Rosa multiflora Thunberg)

Description

Multiflora rose is a perennial, thorny shrub of medium height. Its arching or trailing stems can root at the tip, forming dense thickets. The compound leaves alternate along the stem; each leaf has 5-11 oval leaflets, the edges of which are toothed. In late spring, multiflora rose blooms in tapering clusters of white flowers. As in other rose species, the fruits are small, red hips. The seeds found in the hips are sought after by many different bird species during winter.

Habitat

Usually found in fields, pastures and along roadsides, multiflora rose can also appear in dense forest where fallen trees have opened a gap in the forest canopy. It is adaptable to a wide range of environments but is not found in standing water or in extremely dry habitats.

Distribution

Multiflora rose is native to Asia and was brought to the United States from Japan in the 1880's by horticulturists. Later, wildlife managers planted it for wildlife food and cover. Its was also used for control of soil erosion and on highway medians to reduce headlight glare. Multiflora rose is now found throughout most of the United States. It has established itself in all but a dozen counties of Virginia. The Virginia Department of Agriculture and Consumer Services has listed this plant as a noxious weed.

Threats

Multiflora rose forms dense thickets which can choke out native plant species. These thickets act as living fences, impenetrable by man or large animals. Results form studies done on multiflora rose suggest it is highly competitive for soil nutrients and has lowered crop yields on adjacent fields.

Control

Lightly infested areas may be cleared with a shovel or grubbing hoe provided the entire root is removed. Severe infestations of multiflora rose are effectively controlled by mowing or cutting. This treatment must be repeated 3-6 times a year for 2-4 years.

Applying a glyphosate herbicide directly to freshly cut stumps helps insure kill of the entire root system. This method is most effective if done late in the growing season. Foliar application of a glyphosate herbicide will also kill multiflora rose. Glyphosate herbicides are

recommended because they are biodegradable. However, glyphosate is a nonselective, systemic herbicide and will affect all green vegetation with which it comes into contact. To be safe and effective, herbicide use requires knowledge of the chemicals and their appropriate concentrations as well as understanding of the method and timing of their application. Consult an agricultural extension agent or a natural resource specialist for more information on these control methods.

In some situations, a prescribed burn during the early growing season may be an appropriate method of control. As with mechanical control methods, follow-up burn treatments may be necessary for several years to remove plants sprouting from stems or seed. Seek the advice of a natural resource specialist before implementing this control method.

Suggested Alternative Plants

Some native shrubs with attractive flowers and/or fruit production useful to wildlife include Carolina rose (Rosa carolina), high-bush blueberry (Vaccinium corymbosum), black haw (Viburnum prunifolium), and deciduous holly (Ilex decidua). These species should be available at most large nurseries and garden centers.

For more information contact:

Virginia Native Plant Society
P.O. Box 844
Annadale, VA 22003

Virginia Department of Conservation and Recreation
Division of Natural Heritage
217 Governor Street, 3rd Floor
Richmond, VA 23219

[Taken from The Nature Conservancy website on periwinkles found at http://tncweeds.ucdavis.edu/esadocs/vincmajo.html.]

ELEMENT STEWARDSHIP ABSTRACT
for

Vinca major

Periwinkle

To the User:

Element Stewardship Abstracts (ESAs) are prepared to provide The Nature Conservancy's Stewardship staff and other land managers with current management-related information on those species and communities that are most important to protect, or most important to control. The abstracts organize and summarize data from numerous sources including literature and researchers and managers actively working with the species or community.

We hope, by providing this abstract free of charge, to encourage users to contribute their information to the abstract. This sharing of information will benefit all land managers by ensuring the availability of an abstract that contains up-to-date information on management techniques and knowledgeable contacts. Contributors of information will be acknowledged within the abstract and receive updated editions. To contribute information, contact the editor whose address is listed at the end of the document.

For ease of update and retrievability, the abstracts are stored on computer at the national office of The Nature Conservancy. This abstract is a compilation of available information and is not an endorsement of particular practices or products.

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Authors of this Abstract:

Caitlin Bean, Mary J. Russo (Revision)

1815 North Lynn Street, Arlington, Virginia 22209 (703) 841 5300

The Nature Conservancy
Element Stewardship Abstract
For Vinca major

I. IDENTIFIERS

Common Name: Periwinkle Global Rank:

General Description:

The following description of Vinca major is adapted from Munz and Keck (1973).

Vinca major, a member of the Dogbane Family (Apocynaceae), is a perennial, evergreen herb with erect flowering stems (0.25-0.5 m long) and trailing non-flowering stems (1 m long), which root at the nodes (Gilkey 1957). The stems contain a milky latex. The shiny, dark green leaves are 2-3 cm long, opposite, round-ovate, and pinnately veined. The entire margins are ciliate with hairs 0.1-0.4 mm long, and there are usually numerous hairs along the midribs on the upper surface (Stearn 1973). The blades have a cordate base and are acute to obtuse at the apex. The almost glabrous petioles are 0.5-2 cm long.

The flowers, which are regular and solitary, are borne in the axil of every other leaf. The slender pedicels are 3-5 cm long. The calyx is five-parted with essentially equal lobes of about 1 cm long. The violet or blue corolla (2.5-3 cm long) is salverform, equally five-parted, and with the tube pubescent within. The five stamens alternate with the corolla lobes and are inserted at the summit of the corolla tube. Above the insertion of the stamens is a zone of hairs (Stearn 1973).

The two slender cylindric follicles are somewhat torulous, about 4-5 cm long, and bear 3-5 seeds. The seeds are without coma.

The features of this species are comparatively larger throughout than those of V. minor, its closest living relative. Although both species are grown in cultivation, only V. major has established itself as a weed. The characteristics of V. major that distinguish it from other California species are its milky latex, dark green leaves, and periwinkle-colored flowers. Since it does not reproduce by seed in California, seedling characteristics are not reported here.

II. STEWARDSHIP SUMMARY

III. NATURAL HISTORY

Habitat:

Vinca major is a native from southern Switzerland southward around much of the Mediterranean basin, from Portugal to Turkey, and across much of north Africa (Lawrence 1959). It has been introduced on many continents as a medicinal herb and subsequently as an ornamental ground cover (Schittler 1973). It has been cultivated in areas of the U.S. with mild or temperate climates where it has since naturalized. In California, it is known to occur in 12 counties (McClintock 1985).

Vinca major grows most vigorously in moist soil with only partial sun, "but it will grow in the deepest shade, even in poor soil" (Bailey 1914). It is liable to cold damage during hard winters (Stearn 1973). Hot, dry weather will cause Vinca to die back as well. It is most frequently found as an escape in, "moist rich soils bordering gardens, lawns, roadsides, cemeteries, and shaded waste places, in localities where it has been planted extensively as ground cover" (Muenscher 1955).

Ecology:

V. major presumably evolved directly from a V. minor-like ancestor with a doubling of chromosomes. In V. major 2n=92 and in V. minor 2n=46 (Stearn 1973). Apparently such polyploidy is frequently associated with rampant vegetative growth and poor reproduction by seed (Salisbury 1961). Horticulturists interested in Vinca major for ornamental purposes have long been aware that the best means of propagating is by division or by cuttings, as the seeds rarely mature (Bailey 1914).

Reproduction:

In California, Vinca major does not reproduce by seed in the wild. Quantitative data on the rate of spread of Vinca are not available from the literature. It is most often seen spreading from old home sites. As a result

of its shade requirement it often grows in patches around the bases of trees or spreads up and down drainages where the cover is dense. In ideal growth conditions, Vinca major can spread with great rapidity by means of its arching stolons, which root at the tips (Salisbury 1961).

IV. CONDITION

V. MANAGEMENT/MONITORING

Threats:

Once established, "it forms a dense carpet to the exclusion of other herbs" (Bailey 1914). This creates a problem where it is competing in areas with native flora (McClintock 1985). It appears to be quite stable in the environment; dry or cold weather may temporarily set growth back, but Vinca quickly resprouts and regains lost ground coverage.

Rate of spread is not known from the literature, but usually it spreads only from the point of planting along shady corridors.

Management Requirements:

Former preserve managers at TNC's Santa Rosa Plateau and Ring Mountain preserves in California indicated that the extent of V. major on those properties has been increasing. However, monitoring is still required to determine rate of spread and to compare management practices if implemented.

Detailed observations focused on the vegetational change of the affected area over time will help determine what method of control would be most efficient.

This element does require active management to control and/or eliminate it. Researched methods of control are listed below.

MECHANICAL CONTROL

Muenscher (1955) suggests manual removal of Vinca. He advocates raising the runners with a rake and mowing them close or digging them out by hand.

CHEMICAL CONTROL

Hilgendorf (1952) simply recommends, "spraying with the oil-based esters of 2,4-D and kerosene 1 part in 20." Matthews (1962), the principal scientific officer of the Department of Agriculture in Wellington, wrote, "On this plant (V. major), 2,3,6 trichlorobenzoic acid (2,3,6-TBA) has been more effective than other materials such as 2,4-D and diesel fuel. (2,3,6-TBA is an amine salt preparation containing 2.4 pounds acid equivalent per gallon. It is sold under the proprietary name of "Trysben 200.") The material must be applied in early spring so that it is washed into the soil, as little or no penetration occurs through the leaf. A rate of 30 lb per acre is recommended. Fenuron (discontinued; formerly manufactured by DuPont) at similar rates is equally effective when applied in the absence of mulch and sufficient moisture."

R. Schonholz, an environmental consultant for Larry Seeman and Associates, Berkeley, CA, explained that environmentally benign herbicides are not effective on Vinca due to the waxy cuticle of the leaves that make chemical penetration difficult. Even the makers of Roundup, an herbicide that biodegrades within a week, advise against its use on Vinca. However, Tom

Griggs, Preserve Manager at TNC's Cosumnes River Preserve in California, and Geoffrey Babb, former manager of two TNC preserves in Arizona, have had some success in eradicating Vinca by using Roundup (see MGMT-PROGRAMS below).

The most caustic chemicals, including paraquat (made by Chevron) and "Goal," which contains the active ingredient oxyflurfen, may be considered strong enough to eradicate Vinca due to their persistence.

Monterey County farm advisor Harry Agamalen suggested trying a soil fumigant on affected areas. He recommended clearing the surface growth, laying down a plastic tarp, and fumigating with carbon disulfide, an organic fumigant.

Much of the information available on Vinca major was on how to suppress the weeds that could establish amongst its web-like growth, for in many areas it is still propagated for distribution to nurseries. In one such article, "Effect of trifluralin and melordogyne-hapler chitwood on growth of Vinca major L." (Fuchigami and MacDonald 1968), it was discovered that soil applications of one or more pounds per acre of trifluralin severely stunted plant growth and caused galls to be produced on the root tips that were macroscopically similar to those produced by the northern root-knot nematodes. Similar difficulties were encountered by Minnesota growers.

BIOLOGICAL CONTROL

No biological controls are known.

At present, methods suggested for controlling the spread and/or eradication of V. major are scanty. Mechanical means for control include raising the runners and mowing or complete removal by hand. Herbicides proven successful on V. major are 2,4-D, 2,3,6-TBA, and Fenuron, among others. Control programs are currently underway at TNC's Santa Rosa Plateau and Ring Mountain preserves, California, and Mile-Hi/Ramsey Canyon Preserve, Arizona.

VI. RESEARCH

Management Research Programs:

Tom Griggs, Preserve Manager at TNC's Cosumnes River Preserve, has experimented with herbicide methods of control on Vinca around the perimeters of a few buildings at TNC's Santa Rosa Plateau Preserve. In January 1985 he applied a 1% solution of Roundup to the infested area. At the time, Vinca had new growth approximately 5 cm in length. However, most of the plants' biomass had been produced during the past growing season. After two weeks, the Vinca appeared to have stopped growing and all associated grasses were turning yellow. Two months after this treatment, 80% of what was sprayed was dying or dead. The new growth had stopped growing, yellowed and then dropped from the stem.

In some areas within the treated acreage, new growth continued, attaining a height of one foot in two months. This was attributed to incomplete spray coverage. Untreated growth of Vinca in the area had also produced one foot of new growth by March 1985. Griggs (1985) planned to apply Roundup solution on actively growing Vinca again in the near future.

Greg Wolley, former Preserve Manager at TNC's Ring Mountain Preserve, CA, planned to treat V. major in 1985 by applying a 2% solution of Roundup at the beginning of a 7-day forecast of dry weather.

Geoffrey Babb has conducted spray tests of Roundup to eradicate Vinca at TNC's Mile-Hi/Ramsey Canyon Preserve in Arizona. He tested nine eradication regimes. Three groups were simply sprayed with Roundup but in various concentrations: 3%, 4%, or 5% solutions. Another three groups were first cut with a scythe and then sprayed with the three different concentrations of Roundup. The last three groups were sprayed in the same way but afterwards covered with clear plastic.

The greatest success occurred in the groups that were first cut, then sprayed. Wounding the plant appears to allow sufficient absorption of the herbicide, which is usually prevented by Vinca's thick waxy cuticle. Although Babb had the greatest eradication success (nearly 100%) using the cut/spray method with a 5% solution of Roundup, he recommends cutting then spraying with a 3% solution (which resulted in a 70-75% success rate in his tests), and then spot treating where necessary.

Treatment should be done after a rain in early or late spring when soil moisture and air temperatures (at least 70 F, preferably 80 F) are best for active plant growth. Continued warm, moist conditions, as with the monsoon season, encourage active growth, quickly translocating the herbicide, helping to kill the plant. Uniform medium to heavy spraying should be done within 5-10 minutes of cutting. The initial spraying is most efficiently done using a back-pack sprayer, with Wickwiper applicators working well for spot treatments and those near a creek.

For follow-up information, contact current preserve managers:

Gary Bell, Preserve Manager
Santa Rosa Plateau Preserve
22115 Tenaja Road
Murietta, CA 92362
(714) 677-6951

Larry Serpa, Area Manager
Ring Mountain Preserve
3152 Paradise Drive, Room 101
Tiburon, CA 94920
(415) 435-6465

Tom Wood, Preserve Manager
Mile-Hi/Ramsey Canyon Preserve
Rural Route #1, Box 84
Hereford, AZ 85615
(602) 378-2785

Management Research Needs:

The following are specific questions that need study to improve control efforts:

1. What is the potential for land infested with V. major to recover its native vegetation?
2. Is mowing an effective means of controlling V. major?

VII. ADDITIONAL TOPICS

VIII. INFORMATION SOURCES

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IX. DOCUMENT PREPARATION & MAINTENANCE

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[Taken from Native Plant Conservation Alliance, Alien Plant Working Group website. July 10, 1998. Updated July 13, 1998. Website is found at http://www.nps.gov/plants/alien/fact/patol.htm.]

Princess Tree

Paulownia tomentosa (Thunb.) Sieb. & Zucc. ex Steud.

[Princess Tree] NATIVE RANGE: China

DESCRIPTION: Princess tree, also known as royal paulownia or empress tree, is a small to medium sized tree in the figwort family (Scrophulariaceae) that may reach 30-60 feet in height. The bark is rough, gray-brown, and interlaced with shiny, smooth areas. Stems are olive-brown to dark brown, hairy and markedly flattened at the nodes (where stems and branches meet). Leaves are large, broadly oval to heart-shaped, or sometimes shallowly three-lobed, and noticeably hairy on the lower leaf surfaces. They are arranged in pairs along the stem. Conspicuous upright clusters of showy, pale violet, fragrant flowers open in the spring. The fruit is a dry brown capsule with four compartments that may contain several thousand tiny winged seeds. Capsules mature in autumn when they open to release the seeds and then remain attached all winter, providing a handy identification aid.

ECOLOGICAL THREAT: Princess tree is an aggressive ornamental tree that grows rapidly in disturbed natural areas, including forests, streambanks, and steep rocky slopes.

DISTRIBUTION IN THE UNITED STATES: Princess tree is found in 25 states in the eastern U.S., from Maine to Texas. Click here to see another distribution map.

HABITAT IN THE UNITED STATES: Princess tree can be found along roadsides, streambanks, and forest edges. It tolerates infertile and acid soils and drought conditions. It easily adapts to disturbed habitats, including previously burned areas, forests defoliated by pests (such as the gypsy moth) and landslides and can colonize rocky cliffs and scoured riparian zones where it may compete with rare plants in these marginal habitats. Its ability to sprout prolifically from adventitious buds on stems and roots allows it to survive fire, cutting, and even bulldozing in construction areas.

BACKGROUND: Princess tree was introduced into the U.S. as an ornamental and landscape tree around 1840. It was first imported to Europe in the 1830's by the Dutch East India Company and brought to North

America a few years later. This tree has since become naturalized in the eastern U.S. and is also grown on the west coast. Princess tree is native to western and central China where historical records describe its medicinal, ornamental, and timber uses as early as the third century B.C. It was cultivated centuries ago in Japan where it is valued in many traditions. Recently it has also been grown in plantations and harvested for export to Japan where its wood is highly valued.

METHODS OF REPRODUCTION & DISPERSAL: Princess tree can reproduce from seed or from root sprouts; the latter can grow more than 15 feet in a single season. The root branches are shallow and horizontal without a strong taproot. Seed-forming pollen is fully developed before the onset of winter and the insect-pollinated flowers open in spring. A single tree is capable of producing an estimated twenty million seeds that are easily transported long distances by wind and water and may germinate shortly after reaching suitable soil. Seedlings grow quickly and flower in 8-10 years. Mature trees are often structurally unsound and rarely live more than 70 years.

CURRENT MANAGEMENT APPROACHES: Princess tree can be controlled using a variety of mechanical and chemical controls. Hand pulling may be effective for young seedlings. Plants should be pulled as soon as they are large enough to grasp. Seedlings are best pulled after a rain when the soil is loose. The entire root must be removed since broken fragments may resprout. Trees can be cut at ground level with power or manual saws. Cutting is most effective when trees have begun to flower to prevent seed production. Because Princess tree spreads by suckering, resprouts are common after cutting. Cutting should be considered an initial control measure that will require either repeated cutting of resprouts or an herbicidal treatment.

Princess tree seedlings and small trees can be controlled by applying a 2% solution of glyphosate (e.g., Roundup) or triclopyr (e.g., Garlon) and water plus a 0.5% non-ionic surfactant to thoroughly wet all leaves. Use a low pressure and coarse spray pattern to reduce damage from spray drift on non-target species. Glyphosate is a non-selective systemic herbicide that may kill non-target plants that are only partially sprayed. Triclopyr is a selective herbicide for broadleaf species. In areas where desirable grasses are growing , triclopyr can be used with minimal non-target damage.

Girdling is effective on large trees where the use of herbicides is impractical. Using a hatchet, make a cut through the bark encircling the base of the tree,

approximately six inches above the ground. Be sure that the cut goes well below the bark. This method will kill the top of the tree but resprouts are common and may require a follow-up treatment with a foliar herbicide.

The cut stump method, that is applying herbicide to freshly cut stumps, should be considered for individual trees or when desirable plants are nearby that might be impacted by foliar applications. Stump treatments can be used as long as the ground is not frozen. Begin treatments by horizontally cutting stems at or near ground level. Immediately apply a 50% solution of glyphosate or triclopyr and water to the cut stump making sure to cover the outer 20% of the stump. Basal bark applications are effective throughout the year as long as the ground is not frozen. Apply a mixture of 25% triclopyr and 75% horticultural oil to the base of the tree trunk to a height of 12-15 inches from the ground. Thorough wetting is necessary for good control; spray until run-off is noticeable at the ground line.

USE PESTICIDES WISELY: ALWAYS READ THE ENTIRE PESTICIDE LABEL CAREFULLY, FOLLOW ALL MIXING AND APPLICATION INSTRUCTIONS AND WEAR ALL RECOMMENDED PERSONAL PROTECTIVE GEAR AND CLOTHING. CONTACT YOUR STATE DEPARTMENT OF AGRICULTURE FOR ANY ADDITIONAL PESTICIDE USE REQUIREMENTS, RESTRICTIONS OR RECOMMENDATIONS.

NOTICE: MENTION OF PESTICIDE PRODUCTS ON THIS WEB SITE DOES NOT CONSTITUTE ENDORSEMENT OF ANY MATERIAL. For more information on the management of Princess Tree, please contact:

Kris Johnson, Great Smoky Mountains National Park, Gatlinburg, TN (kris_johnson@nps.gov)

SUGGESTED ALTERNATIVE PLANTS: Many native shrubs and trees make excellent alternatives to Princess tree. Examples include serviceberry (Amelanchier canadensis and A. arborea), redbud (Cercis canadensis), flowering dogwood (Cornus florida), American holly (Ilex opaca), red mulberry (Morus rubra), spicebush (Lindera benzoin), and sassafras (Sassafras albidum). Contact the native plant society in your state for additional recommendations and for information on local sources of native plants.

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Appendix C -- Alien Threat/Control Ranking Sheets

Exotic Species Ranking System
Data Summary Form

Park: GEWA

Species: Autumn olive
Elaeagnus umbellata

Significance of Impact:

Current Level of Impact (50): 25

Innate Ability to Become a Pest (50): 39

Total (100): 64

Feasibility of Control: Total (100): 56

Urgency: High

I. Significance of Impact:

A. Current Level of Impact

1. Distribution relative to disturbance regime (10, 1, 2, 5, 10): 2
2. Abundance
   a. Number of populations (1, 3, 5): 1
   b. Coverage/extent of populations (1, 2, 3, 5): 2
3. Effect on natural processes and character (0, 3, 7,10, 15): 10
4. Significance of threat to park resources (0, 2, 4, 8, 10): 8
5. Level of visual impact to an ecologist (0, 2, 4, 5): 2

Total (50 possible): 25

B. Innate Ability of Species to Become a Pest

1. Ability to complete life cycle in area of concern (0, 5): 5
2. Mode of reproduction (1, 3, 5): 3
3. Vegetative reproduction (0, 1, 3, 5): 0
4. Frequency of sexual reproduction (0, 1, 3, 5): 5
5. Number of seeds per plant (1, 3, 5): 3
6. Dispersal ability (0, 5): 5
7. Germination requirements (0, 3, 5): 3
8. Competitive ability (0, 3, 5): 5
9. Known level of impact in natural areas (0, 1, 3, 5, 10): 10

Total (50 possible): 39

A + B (100 possible): 64

II. Feasibility of Control or Management

A. Abundance within Park

1. Number of populations (1, 3, 5) 3

2. Coverage/extent of populations (1, 2, 3, 5) 3

B. Ease of Control

1. Seed banks (0, 5, 15) 5

2. Vegetative regeneration (0, 5, 15) 5

3. Level of effort required (1, 5, 10, 15) 10

4. Abundance and proximity of propagules (0, 5, 10, 15) 5

C. Side Effects of Chemical/Mechanical Control (0, 5, 15) 15

D. Effectiveness of Community Management (0, 5, 10) 10

E. Biological Control (0, 5,10) 0

Total (100 possible) 56

Urgency: High

Exotic Species Ranking System
Data Summary Form

Park: GEWA

Species: Chinese lespedeza
Lespedeza cuneata

Significance of Impact:

Current Level of Impact (50): 30

Innate Ability to Become a Pest (50): 36

Total (100): 66

Feasibility of Control:

Total (100): 46

Urgency: Medium

I. Significance of Impact:

A. Current Level of Impact

1. Distribution relative to disturbance regime (10, 1, 2, 5, 10): 1

2. Abundance

a. Number of populations (1, 3, 5): 5

b. Coverage/extent of populations (1, 2, 3, 5): 2-3

3. Effect on natural processes and character (0, 3, 7,10, 15): 15

4. Significance of threat to park resources (0, 2, 4, 8, 10): 4

5. Level of visual impact to an ecologist (0, 2, 4, 5): 2

Total (50 possible): 30

B. Innate Ability of Species to Become a Pest

1. Ability to complete life cycle in area of concern (0, 5): 5

2. Mode of reproduction (1, 3, 5): 3

3. Vegetative reproduction (0, 1, 3, 5): 0

4. Frequency of sexual reproduction (0, 1, 3, 5): 5

5. Number of seeds per plant (1, 3, 5): 3

6. Dispersal ability (0, 5): 5

7. Germination requirements (0, 3, 5): 0

8. Competitive ability (0, 3, 5): 5

9. Known level of impact in natural areas (0, 1, 3, 5, 10): 10

Total (50 possible): 36

A + B (100 possible): 66

II. Feasibility of Control or Management

A. Abundance within Park

1. Number of populations (1, 3, 5) 3

2. Coverage/extent of populations (1, 2, 3, 5) 2-3

B. Ease of Control

1. Seed banks (0, 5, 15) 0

2. Vegetative regeneration (0, 5, 15) 5

3. Level of effort required (1, 5, 10, 15) 5

4. Abundance and proximity of propagules (0, 5, 10, 15) 10

C. Side Effects of Chemical/Mechanical Control (0, 5, 15) 5

D. Effectiveness of Community Management (0, 5, 10) 10

E. Biological Control (0, 5,10) 5

Total (100 possible) 46

Urgency: Medium

Exotic Species Ranking System
Data Summary Form

Park: GEWA

Species: Common mullein
Verbascum phlomoides

Significance of Impact:

Current Level of Impact (50) Ø

Innate Ability to Become a Pest (50) 24

Total (100) 24

Feasibility of Control: Total (100) 41

Urgency: Medium

I. Significance of Impact:

A. Current Level of Impact

1. Distribution relative to disturbance regime (10, 1, 2, 5, 10) -10

2. Abundance

a. Number of populations (1, 3, 5) 1

b. Coverage/extent of populations (1, 2, 3, 5) 0

3. Effect on natural processes and character (0, 3, 7,10, 15) 3

4. Significance of threat to park resources (0, 2, 4, 8, 10) 2

5. Level of visual impact to an ecologist (0, 2, 4, 5) 4

Total (50 possible) Ø

B. Innate Ability of Species to Become a Pest

1. Ability to complete life cycle in area of concern (0, 5) 5

2. Mode of reproduction (1, 3, 5) 3

3. Vegetative reproduction (0, 1, 3, 5) 0

4. Frequency of sexual reproduction (0, 1, 3, 5) 5

5. Number of seeds per plant (1, 3, 5) 3

6. Dispersal ability (0, 5) 0

7. Germination requirements (0, 3, 5) 0

8. Competitive ability (0, 3, 5) 5

9. Known level of impact in natural areas (0, 1, 3, 5, 10) 3

Total (50 possible) 24

A + B (100 possible) 24

II. Feasibility of Control or Management

A. Abundance within Park

1. Number of populations (1, 3, 5) 5

2. Coverage/extent of populations (1, 2, 3, 5) 5

B. Ease of Control

1. Seed banks (0, 5, 15) 0

2. Vegetative regeneration (0, 5, 15) 5

3. Level of effort required (1, 5, 10, 15) 1

4. Abundance and proximity of propagules (0, 5, 10, 15) 0

C. Side Effects of Chemical/Mechanical Control (0, 5, 15) 15

D. Effectiveness of Community Management (0, 5, 10) 10

E. Biological Control (0, 5,10) 0

Total (100 possible) 41

Urgency: Medium

Exotic Species Ranking System
Data Summary Form

Park: GEWA

Species: English ivy
Hedera helix

Significance of Impact:

Current Level of Impact (50): 19

Innate Ability to Become a Pest (50): 41

Total (100): 60

Feasibility of Control: Total (100): 45

Urgency: Medium

I. Significance of Impact:

A. Current Level of Impact

1. Distribution relative to disturbance regime (10, 1, 2, 5, 10): 2
2. Abundance
   a. Number of populations (1, 3, 5): 1
   b. Coverage/extent of populations (1, 2, 3, 5): 0
3. Effect on natural processes and character (0, 3, 7,10, 15): 10
4. Significance of threat to park resources (0, 2, 4, 8, 10): 4
5. Level of visual impact to an ecologist (0, 2, 4, 5): 2

Total (50 possible): 19

B. Innate Ability of Species to Become a Pest

1. Ability to complete life cycle in area of concern (0, 5): 5
2. Mode of reproduction (1, 3, 5): 5
3. Vegetative reproduction (0, 1, 3, 5): 5
4. Frequency of sexual reproduction (0, 1, 3, 5): 3-5
5. Number of seeds per plant (1, 3, 5): 3
6. Dispersal ability (0, 5): 0
7. Germination requirements (0, 3, 5): 3
8. Competitive ability (0, 3, 5): 5
9. Known level of impact in natural areas (0, 1, 3, 5, 10): 10

Total (50 possible): 41

A + B (100 possible): 60

II. Feasibility of Control or Management

A. Abundance within Park

1. Number of populations (1, 3, 5) 5

2. Coverage/extent of populations (1, 2, 3, 5) 5

B. Ease of Control

1. Seed banks (0, 5, 15) 0-5

2. Vegetative regeneration (0, 5, 15) 0

3. Level of effort required (1, 5, 10, 15) 5

4. Abundance and proximity of propagules (0, 5, 10, 15) 5-10

C. Side Effects of Chemical/Mechanical Control (0, 5, 15) 5

D. Effectiveness of Community Management (0, 5, 10) 10

E. Biological Control (0, 5,10) 0

Total (100 possible) 45

Urgency: Medium

Exotic Species Ranking System
Data Summary Form

Park: GEWA

Species: Japanese honeysuckle
Lonicera japonica

Significance of Impact:

Current Level of Impact (50): 29

Innate Ability to Become a Pest (50): 43

Total (100): 72

Feasibility of Control:

Total (100): 24

Urgency: High

I. Significance of Impact:

A. Current Level of Impact

1. Distribution relative to disturbance regime (10, 1, 2, 5, 10): 2

2. Abundance

a. Number of populations (1, 3, 5): 5

b. Coverage/extent of populations (1, 2, 3, 5): 2

3. Effect on natural processes and character (0, 3, 7,10, 15): 10

4. Significance of threat to park resources (0, 2, 4, 8, 10): 8

5. Level of visual impact to an ecologist (0, 2, 4, 5): 2

Total (50 possible): 29

B. Innate Ability of Species to Become a Pest

1. Ability to complete life cycle in area of concern (0, 5): 5

2. Mode of reproduction (1, 3, 5): 5

3. Vegetative reproduction (0, 1, 3, 5): 5

4. Frequency of sexual reproduction (0, 1, 3, 5): 5

5. Number of seeds per plant (1, 3, 5): 5

6. Dispersal ability (0, 5): 5

7. Germination requirements (0, 3, 5): 3

8. Competitive ability (0, 3, 5): 5

9. Known level of impact in natural areas (0, 1, 3, 5, 10): 5

Total (50 possible): 43

A + B (100 possible): 72

II. Feasibility of Control or Management

A. Abundance within Park

1. Number of populations (1, 3, 5) 1

2. Coverage/extent of populations (1, 2, 3, 5) 3

B. Ease of Control

1. Seed banks (0, 5, 15) 5

2. Vegetative regeneration (0, 5, 15) 0

3. Level of effort required (1, 5, 10, 15) 5

4. Abundance and proximity of propagules (0, 5, 10, 15) 0

C. Side Effects of Chemical/Mechanical Control (0, 5, 15) 5

D. Effectiveness of Community Management (0, 5, 10) 0-5

E. Biological Control (0, 5,10) 0

Total (100 possible) 24

Urgency: High

Exotic Species Ranking System
Data Summary Form

Park: GEWA

Species: Multiflora rose
Rosa multifora

Significance of Impact:

Current Level of Impact (50): 30

Innate Ability to Become a Pest (50): 41

Total (100): 71

Feasibility of Control:

Total (100): 29

Urgency: High

I. Significance of Impact:

A. Current Level of Impact

1. Distribution relative to disturbance regime (10, 1, 2, 5, 10): 2

2. Abundance

a. Number of populations (1, 3, 5): 5

b. Coverage/extent of populations (1, 2, 3, 5): 2

3. Effect on natural processes and character (0, 3, 7,10, 15): 15

4. Significance of threat to park resources (0, 2, 4, 8, 10): 4

5. Level of visual impact to an ecologist (0, 2, 4, 5): 2

Total (50 possible): 30

B. Innate Ability of Species to Become a Pest

1. Ability to complete life cycle in area of concern (0, 5): 5

2. Mode of reproduction (1, 3, 5): 3-5

3. Vegetative reproduction (0, 1, 3, 5): 1

4. Frequency of sexual reproduction (0, 1, 3, 5): 5

5. Number of seeds per plant (1, 3, 5): 5

6. Dispersal ability (0, 5): 5

7. Germination requirements (0, 3, 5): 5

8. Competitive ability (0, 3, 5): 5

9. Known level of impact in natural areas (0, 1, 3, 5, 10): 5

Total (50 possible): 41

A + B (100 possible): 71

II. Feasibility of Control or Management

A. Abundance within Park

1. Number of populations (1, 3, 5) 1

2. Coverage/extent of populations (1, 2, 3, 5) 3

B. Ease of Control

1. Seed banks (0, 5, 15) 0

2. Vegetative regeneration (0, 5, 15) 5

3. Level of effort required (1, 5, 10, 15) 5

4. Abundance and proximity of propagules (0, 5, 10, 15) 0

C. Side Effects of Chemical/Mechanical Control (0, 5, 15) 15

D. Effectiveness of Community Management (0, 5, 10) 0

E. Biological Control (0, 5,10) (Know virus impacts natives) 0

Total (100 possible) 29

Urgency: High

Exotic Species Ranking System
Data Summary Form

Park: GEWA

Species: Orchard grass
Dactylis glomerata

Significance of Impact:

Current Level of Impact (50) 23

Innate Ability to Become a Pest (50) 29

Total (100) 52

Feasibility of Control: Total (100) 55

Urgency: Medium

I. Significance of Impact:

A. Current Level of Impact

1. Distribution relative to disturbance regime (10, 1, 2, 5, 10) 2

2. Abundance

a. Number of populations (1, 3, 5) 3

b. Coverage/extent of populations (1, 2, 3, 5) 2

3. Effect on natural processes and character (0, 3, 7,10, 15) 10

4. Significance of threat to park resources (0, 2, 4, 8, 10) 4

5. Level of visual impact to an ecologist (0, 2, 4, 5) 2

Total (50 possible) 23

B. Innate Ability of Species to Become a Pest

1. Ability to complete life cycle in area of concern (0, 5) 5

2. Mode of reproduction (1, 3, 5) 3

3. Vegetative reproduction (0, 1, 3, 5) 0

4. Frequency of sexual reproduction (0, 1, 3, 5) 5

5. Number of seeds per plant (1, 3, 5) 3

6. Dispersal ability (0, 5) 0

7. Germination requirements (0, 3, 5) 3

8. Competitive ability (0, 3, 5) 5

9. Known level of impact in natural areas (0, 1, 3, 5, 10) 5

Total (50 possible) 29

A + B (100 possible) 52

II. Feasibility of Control or Management

A. Abundance within Park

1. Number of populations (1, 3, 5) 3

2. Coverage/extent of populations (1, 2, 3, 5) 2

B. Ease of Control

1. Seed banks (0, 5, 15) 5

2. Vegetative regeneration (0, 5, 15) 10

3. Level of effort required (1, 5, 10, 15) 10

4. Abundance and proximity of propagules (0, 5, 10, 15) 10

C. Side Effects of Chemical/Mechanical Control (0, 5, 15) 5

D. Effectiveness of Community Management (0, 5, 10) 10

E. Biological Control (0, 5,10) 0

Total (100 possible) 55

Urgency: Medium

Exotic Species Ranking System
Data Summary Form

Park: GEWA

Species: Periwinkle
Vinca minor/major

Significance of Impact:

Current Level of Impact (50): 19

Innate Ability to Become a Pest (50): 29

Total (100): 48

Feasibility of Control:

Total (100): 48

Urgency: Low

I. Significance of Impact:

A. Current Level of Impact

1. Distribution relative to disturbance regime (10, 1, 2, 5, 10): 2
2. Abundance
   a. Number of populations (1, 3, 5): 3
   b. Coverage/extent of populations (1, 2, 3, 5): 0
3. Effect on natural processes and character (0, 3, 7,10, 15): 10
4. Significance of threat to park resources (0, 2, 4, 8, 10): 2
5. Level of visual impact to an ecologist (0, 2, 4, 5): 2

Total (50 possible): 19

B. Innate Ability of Species to Become a Pest

1. Ability to complete life cycle in area of concern (0, 5): 5
2. Mode of reproduction (1, 3, 5): 5
3. Vegetative reproduction (0, 1, 3, 5): (3)5
4. Frequency of sexual reproduction (0, 1, 3, 5) (v. major not effective): 0/5
5. Number of seeds per plant (1, 3, 5): 1
6. Dispersal ability (0, 5): 0
7. Germination requirements (0, 3, 5): 5
8. Competitive ability (0, 3, 5): 5
9. Known level of impact in natural areas (0, 1, 3, 5, 10): 5

Total (50 possible): 29

A + B (100 possible): 48

II. Feasibility of Control or Management

A. Abundance within Park	
1. Number of populations (1, 3, 5)	3
2. Coverage/extent of populations (1, 2, 3, 5)	5
B. Ease of Control	
1. Seed banks (0, 5, 15)	15
2. Vegetative regeneration (0, 5, 15)	0 ↑ 15? data?
3. Level of effort required (1, 5, 10, 15)	5
4. Abundance and proximity of propagules (0, 5, 10, 15)	10
C. Side Effects of Chemical/Mechanical Control (0, 5, 15)	0 — 5 side effect
D. Effectiveness of Community Management (0, 5, 10)	10
E. Biological Control (0, 5,10)	0
Total (100 possible)	40

Urgency: Low

Exotic Species Ranking System
Data Summary Form

Park: GEWA

Species: Phragmites or common reed
Phragmites australis

Significance of Impact:

Current Level of Impact (50): 38

Innate Ability to Become a Pest (50): 48

Total (100): 86

Feasibility of Control:

Total (100): 35

Urgency: High

I. Significance of Impact:

A. Current Level of Impact

1. Distribution relative to disturbance regime (10, 1, 2, 5, 10): 1-2

2. Abundance

a. Number of populations (1, 3, 5): 5

b. Coverage/extent of populations (1, 2, 3, 5): 2

3. Effect on natural processes and character (0, 3, 7.10, 15): 15

4. Significance of threat to park resources (0, 2, 4, 8, 10): 10

5. Level of visual impact to an ecologist (0, 2, 4, 5): 4

Total (50 possible): 38

B. Innate Ability of Species to Become a Pest

1. Ability to complete life cycle in area of concern (0, 5): 5

2. Mode of reproduction (1, 3, 5): 5

3. Vegetative reproduction (0, 1, 3, 5): 5

4. Frequency of sexual reproduction (0, 1, 3, 5): 5

5. Number of seeds per plant (1, 3, 5): 3

6. Dispersal ability (0, 5): 5

7. Germination requirements (0, 3, 5): 5

8. Competitive ability (0, 3, 5): 5

9. Known level of impact in natural areas (0, 1, 3, 5, 10): 10

Total (50 possible): 48

A + B (100 possible): 86

II. Feasibility of Control or Management

A. Abundance within Park

1. Number of populations (1, 3, 5) 1

2. Coverage/extent of populations (1, 2, 3, 5) 3

B. Ease of Control

1. Seed banks (0, 5, 15) 15

2. Vegetative regeneration (0, 5, 15) 5

3. Level of effort required (1, 5, 10, 15) 1

4. Abundance and proximity of propagules (0, 5, 10, 15) 0

C. Side Effects of Chemical/Mechanical Control (0, 5, 15) (monoculture) 5

D. Effectiveness of Community Management (0, 5, 10) 5

E. Biological Control (0, 5,10) 0

Total (100 possible) 35

Urgency: High

Exotic Species Ranking System
Data Summary Form

Park: GEWA

Species: Princess tree
Paulownia tomentosa

Significance of Impact:

Current Level of Impact (50): 17

Innate Ability to Become a Pest (50): 33

Total (100): 50

Feasibility of Control: Total (100): 60

Urgency: High-Medium

I. Significance of Impact:

A. Current Level of Impact

1. Distribution relative to disturbance regime (10, 1, 2, 5, 10): 2

2. Abundance

a. Number of populations (1, 3, 5): 1

b. Coverage/extent of populations (1, 2, 3, 5): 0

3. Effect on natural processes and character (0, 3, 7,10, 15): 10

4. Significance of threat to park resources (0, 2, 4, 8, 10): 4

5. Level of visual impact to an ecologist (0, 2, 4, 5): 0

Total (50 possible): 17

B. Innate Ability of Species to Become a Pest

1. Ability to complete life cycle in area of concern (0, 5): 5

2. Mode of reproduction (1, 3, 5): 3

3. Vegetative reproduction (0, 1, 3, 5): 0

4. Frequency of sexual reproduction (0, 1, 3, 5): 5

5. Number of seeds per plant (1, 3, 5): 5

6. Dispersal ability (0, 5): 5

7. Germination requirements (0, 3, 5): 0

8. Competitive ability (0, 3, 5): 5

9. Known level of impact in natural areas (0, 1, 3, 5, 10): 5

Total (50 possible): 33

A + B (100 possible): 50

II. Feasibility of Control or Management

A. Abundance within Park

1. Number of populations (1, 3, 5) 5

2. Coverage/extent of populations (1, 2, 3, 5) 5

B. Ease of Control

1. Seed banks (0, 5, 15) 5

2. Vegetative regeneration (0, 5, 15) 5

3. Level of effort required (1, 5, 10, 15) 10

4. Abundance and proximity of propagules (0, 5, 10, 15) 5

C. Side Effects of Chemical/Mechanical Control (0, 5, 15) 15

D. Effectiveness of Community Management (0, 5, 10) 10

E. Biological Control (0, 5,10) 0

Total (100 possible) 60

Urgency: High-Me

Exotic Species Ranking System
Data Summary Form

Park: GEWA

Species: Tall fescue
Festuca elation

Significance of Impact:

Current Level of Impact (50): 24

Innate Ability to Become a Pest (50): 31

Total (100): 55

Feasibility of Control:

Total (100): 58

Urgency: Medium

I. Significance of Impact:

A. Current Level of Impact

1. Distribution relative to disturbance regime (10, 1, 2, 5, 10): 2

2. Abundance

a. Number of populations (1, 3, 5): 3

b. Coverage/extent of populations (1, 2, 3, 5): 3

3. Effect on natural processes and character (0, 3, 7,10, 15): 10

4. Significance of threat to park resources (0, 2, 4, 8, 10): 4

5. Level of visual impact to an ecologist (0, 2, 4, 5): 2

Total (50 possible): 24

B. Innate Ability of Species to Become a Pest

1. Ability to complete life cycle in area of concern (0, 5): 5

2. Mode of reproduction (1, 3, 5): 3

3. Vegetative reproduction (0, 1, 3, 5): 0

4. Frequency of sexual reproduction (0, 1, 3, 5): 5

5. Number of seeds per plant (1, 3, 5): 3

6. Dispersal ability (0, 5): 0

7. Germination requirements (0, 3, 5): 5

8. Competitive ability (0, 3, 5): 5

9. Known level of impact in natural areas (0, 1, 3, 5, 10): 5

Total (50 possible): 31

A + B (100 possible): 55

II. Feasibility of Control or Management

A. Abundance within Park	
1. Number of populations (1, 3, 5)	1
2. Coverage/extent of populations (1, 2, 3, 5)	2
B. Ease of Control	
1. Seed banks (0, 5, 15)	5-15
2. Vegetative regeneration (0, 5, 15)	10
3. Level of effort required (1, 5, 10, 15)	10
4. Abundance and proximity of propagules (0, 5, 10, 15)	10
C. Side Effects of Chemical/Mechanical Control (0, 5, 15)	5
D. Effectiveness of Community Management (0, 5, 10)	10
E. Biological Control (0, 5,10)	0
Total (100 possible)	58

Urgency: Medium

Exotic Species Ranking System
Data Summary Form

Park: GEWA Species:

Significance of Impact:

Current Level of Impact (50) _____

Innate Ability to Become a Pest (50) _____ Total (100) _____

Feasibility of Control: Total (100) _____

Urgency: _____

I. Significance of Impact:

A. Current Level of Impact

1. Distribution relative to disturbance regime (10, 1, 2, 5, 10) _____

2. Abundance

a. Number of populations (1, 3, 5) _____

b. Coverage/extent of populations (1, 2, 3, 5) _____

3. Effect on natural processes and character (0, 3, 7,10, 15) _____

4. Significance of threat to park resources (0, 2, 4, 8, 10) _____

5. Level of visual impact to an ecologist (0, 2, 4, 5) _____

Total (50 possible) _____

B. Innate Ability of Species to Become a Pest

1. Ability to complete life cycle in area of concern (0, 5) _____

2. Mode of reproduction (1, 3, 5) _____

3. Vegetative reproduction (0, 1, 3, 5) _____

4. Frequency of sexual reproduction (0, 1, 3, 5) _____

5. Number of seeds per plant (1, 3, 5) _____

6. Dispersal ability (0, 5) _____

7. Germination requirements (0, 3, 5) _____

8. Competitive ability (0, 3, 5) _____

9. Known level of impact in natural areas (0, 1, 3, 5, 10) _____

Total (50 possible) _____

A + B (100 possible) _____

II. Feasibility of Control or Management

A. Abundance within Park

1. Number of populations (1, 3, 5) _____

2. Coverage/extent of populations (1, 2, 3, 5) _____

B. Ease of Control

1. Seed banks (0, 5, 15) _____

2. Vegetative regeneration (0, 5, 15) _____

3. Level of effort required (1, 5, 10, 15) _____

4. Abundance and proximity of propagules (0, 5, 10, 15) _____

C. Side Effects of Chemical/Mechanical Control (0, 5, 15) _____

D. Effectiveness of Community Management (0, 5, 10) _____

E. Biological Control (0, 5,10) _____

Total (100 possible) _____

Urgency: _____

Appendix D -- Monitoring Protocols

Non-native Invasive Vegetation Monitoring Protocol
Virginia Invasive Vegetation Management Team

Background: Through the years, parks within the NER-Virginia Subcluster have recognized the presence and introduction of non-native (alien or exotic) vegetation. Many are notable because of their aggressive, invasive nature displacing native species and impacting whole ecosystems. Though many invasives have been documented, there has been little monitoring to determine whether they are expanding or otherwise increasing their impacts upon our resources. We recognize the need for survey/monitoring to follow those trends as well as determine whether control efforts are successful. The VIVMT (Virginia Invasive Vegetation Management Team) will conduct the following monitoring tasks.

I. Parkwide Invasive Vegetation Survey, Monitoring & Mapping

Description of Duties: (1) Locate invasive vegetation centers. The intent is to focus on accessible areas near developments, and adjacent to roads, trails and property boundaries. (2) Identify and inventory vegetation. This focuses on targeted non-native invasives. Threatened or endangered species natives should be noted in the comments. (3) Aerial photo interpretation, map reconnaissance, and mapping of non-native species concentrations. (4) Geographic positioning through GPS electronics. This is for epicenter referencing and/or boundary delineation, depending on available equipment, available satellites, and site configuration. (5) Writing location reports and invasive vegetation summaries. This includes estimates of infestation levels, sources, spread direction, and spread rates.

Duration: This will vary greatly depending on the remaining need of individual parks. COLO and SHEN will not require added surveying. Some monitoring of previous surveys may be needed in the out-year. The remaining parks require supplementary surveying from what was accomplished in 1999, including APCO, BOWA, FRSP, GEWA, PETE, and RICH.

Task Protocols:

I.1. – Systematic Survey/Monitoring

The survey/monitoring scheme is intended to facilitate understanding the presence and infestation levels of invasives within areas likely to become infested. This focus, rather than a parkwide cameo, is necessary due to the narrow time frame of the commissioned VIVMT, and its premier goal of implementing control activities. Since a vast majority of non-native invasives favor areas of open sun and disturbed soils, the survey/monitoring layout will focus on areas of full sun, "edge," and recent or continual soil scarification. Deep forest or undeveloped /unimpacted areas will not be surveyed in this project.

Survey/monitoring will entail the following steps.

(A) Establish starting points for 200-meter (m) line transects. The vicinity of starting points will be done to assure random placement within bounds. On the one hand, randomness is essential to avoid bias, while "bounds" will help distribute transects throughout the park.

(1) Estimate the amount of "edge" within the park. For instance road edge equals the distance of roads times 2 sides of each road (1 mile of road x 2 sides = 2 miles of edge unless the road is a park boundary). The same procedure is done for major trails. Developed area edge equals the circumference or perimeter of all sites combined.

(2) Once these three domains are tallied (roads, trails and developments) calculate the percent of each. For instance, roads-47%; trails-39%, and developed-14%.

(3) Decide whether 10, 20 or 30 transects are needed for the park in question based on park size and apparent initial magnitude of infestation problem.

(4) Using point 2 above as an example, if you decide that 20 transects are needed for park-X, then plan on distributing 50% along roads (10 transects), 40% along trails (8 transects), and 15% around developments (2 transects).

(5) Assign potential transect start points every ¼ mile throughout the infested portion of the park (remember: on each side of roads and trails). Give each potential transect start point a number (1+ for roads, 1+ for trails, and 1+ for developments).

(6) Randomly choose the actual transect set for each domain using a random number table.

Transect starting points shall be on the edge of a roadway, treadpath or yard, parking lot or building, respectively. In the field, describe transect starting points on the *Invasive Vegetation Survey* ***Site Record***. The GPS location of the starting point should also be noted.

(B) From the starting point, establish a compass bearing to follow for the transect layout that is perpendicular to the road, trail or development edge at that point. Note the compass bearing on the *Invasive Vegetation Survey* ***Data Sheet***. The compass bearing should be recorded in magnetic reading rather than with declination correction. (This is to avoid mistaken setting by the crew serving eight different parks.)

Use a random number table to establish the first plot center at a range of 1-to-10 meters from the start point. The remaining nine plot centers shall be systematically placed every 20-m along the transect from the initial plot center. (Note Figure 1.)

Plot rejection criteria (I.1.B.). Reject the plot location (and attempt establishment 10-m further along the transect) if the plot location:

(1) Is wholly or partial on a road.

(2) Is clearly unsafe.

(3) Is on non-forest/non-field such as boulder, cliff or water, etc.

(Note your reasons for plot rejection on the ***Interplot Comment/Notes*** sheet.)

(C) At the plot center, temporarily establish and measure data within three subplots using the *Data Sheet*. (Measuring the three subplot radiuses can be practically done using a rope with knots or measuring tape with adhesive tape at three lengths from the end.) Use the 6-digit species codes for the invasive target species provided in the appendix. If you detect a highly invasive plant not on the target list, create a species code using by using the first three letters of its genus plus first three letters of its species names.

- 1-m^2 subplot (radius=0.564m) – **Herbaceous layer**
  For herbs of any height:
  -- Identify and count all targeted non-native species.
  -- Identify and estimate crown cover of all non-native species within this layer. (Example 1: all ten individuals of one species make up 25% of the subplot. Therefore, document the species with the count=10, and the percent cover=25%.)
- 10-m^2 subplot (radius=1.784m) – **Shrub layer**
  For woody vegetation falling between 1-to-5-m (or obvious woody seedlings less than 1m):
  -- Identify and count all targeted non-native species.
  -- Identify and estimate crown cover of all non-native species within this layer. (Example 2: there are no rooting individuals in the subplot but the area has 30% cover by a vine. Document the species with the count=0, and the cover=30%.)
- 100-m^2 subplot (radius=5.642m) – **Tree layer**
  For woody vegetation taller than 5-m:
  -- Identify and count all targeted non-native species.
  -- Identify and estimate crown cover of all non-native species within the layer. (Examples 1 & 2 apply.)

(D) Between plots, note the species and cover estimates of invasives, comments on site disturbance, and other information that has implications to non-native invasive potential upon the *Invasive Vegetation Survey* ***Interplot Comment/Notes*** sheet.

(E) Enter the field information into the Alien_survey database program. (See Part III below.)

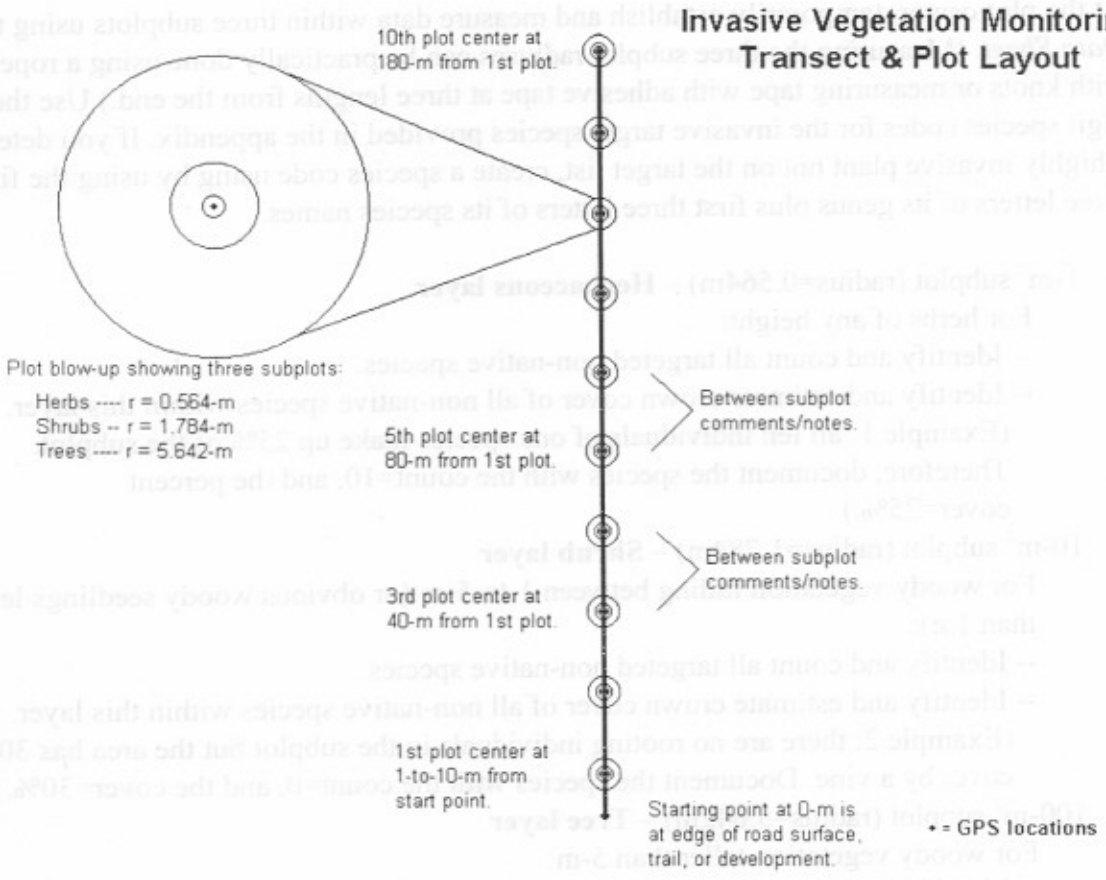

Figure 1. Transect and plot diagram.

I.2. – Epicenter Mapping

Map the locations of concentrated (single or multiple) invasive species epicenters. Using the *Invasive Vegetation Survey* ***Site Record***, and appropriate attachments, do the following.

(A) Map the infestation using a photocopy of appropriate USGS 7.5-minute quadrangles and the most recent aerial photography.

(B) Identify on your map the USGS quadrangle name; site name, and UTM coordinates of the site center (using GPS). Landmark features such as roads, trails, bridges, fences, etc., should be clearly indicated. Natural features, including large trees, forest/field edges, rock outcrops, and streams may also be useful for relocating exotic sites.

(C) Where possible, use GPS to delineate the exterior epicenter boundary.

(D) Enter the information into the Alien_Ops database program. (See Part III below.) Download and correct the GPS data, ensuring that the data is correctly identified with the field transect data name.

The *Site record* and accompanying maps should be filed with the other known alien epicenter location files being maintained by the SHEN-NCR-Operations & Planning Branch Chief. Copies of materials should be made freely available to host parks upon request.

II. Invasive Treatment Monitoring

Description of Duties: Monitoring transects will be established at each treatment site prior to treatment. Follow-up monitoring will take place after one year to determine change and indicate effectiveness. Initial transects may take 1-to-3 hours to install, while follow-up monitoring will take 1-to-1-1/2 hours to complete if transect monuments are easily found. Control objectives are two-fold: (1) effectively eliminate invasive vegetation within designated epicenters; and (2) create a positive track record of safety, efficiency and effectiveness. Treatment monitoring is essential, therefore, to document progress toward both objectives. Treatment monitoring includes elements of survey & monitoring described above.

Task Protocols:

II.1. – Treatment Monitoring

The treatment site monitoring protocol is very similar to the systematic survey/monitoring protocol described above. The differences include: (1) the plots/subplots must fall fully within the treated area and (2) transect direction will not be perpendicular to a road, trail or development. Each treatment site will have two transects that each start from easily relocated points (road, trail or development edges) at generally apposite ends of the unit creating an "X" through the unit. Transect direction (orientation) for a given unit may be subjectively created and will vary from other units to achieve the "X". This system is intended to make annual relocation of transects and plots easily done.

Each treatment site should have 4-to-10 monitoring plots; a portion along each of the two transects. Space the plots apart from one another based on the following table.

Plot spacing along both monitoring transects (based on the longest transect).

- If longest transect is up to 50-m long, space the plots 20-m apart.
- If longest transect is 51-100-m long, space the plots 30-m apart.
- If the longest transect is greater than 100-m long, space the plots 40-m apart.

The first plot of each transect shall be established as with the systematic survey by using a random number table to determine where it falls 1-to-10-m from the transect start point.

Transect start points should be **well documented** with both GPS and on-site monumentation to facilitate finding the point after treatment. Plot monumentation should include two-foot long re-bar and orange flagging. Transect start points should be monumented similarly with other orange flagging on nearby vegetation. Enter the information on the *Invasive Vegetation Survey* ***Site Record*** and into the Alien_survey database program. (See Part III below.)

Plot rejection criteria (II.1). Reject the plot location (and attempt establishment 10-m further along the transect) if the plot location:

(1) Is wholly or partial out of the treatment site.
(2) Falls partially within a plot from the other transect.
(3) Ten plots have already been tallied.

(Note your reasons for plot rejection on the ***Interplot Comment/Notes*** sheet.)

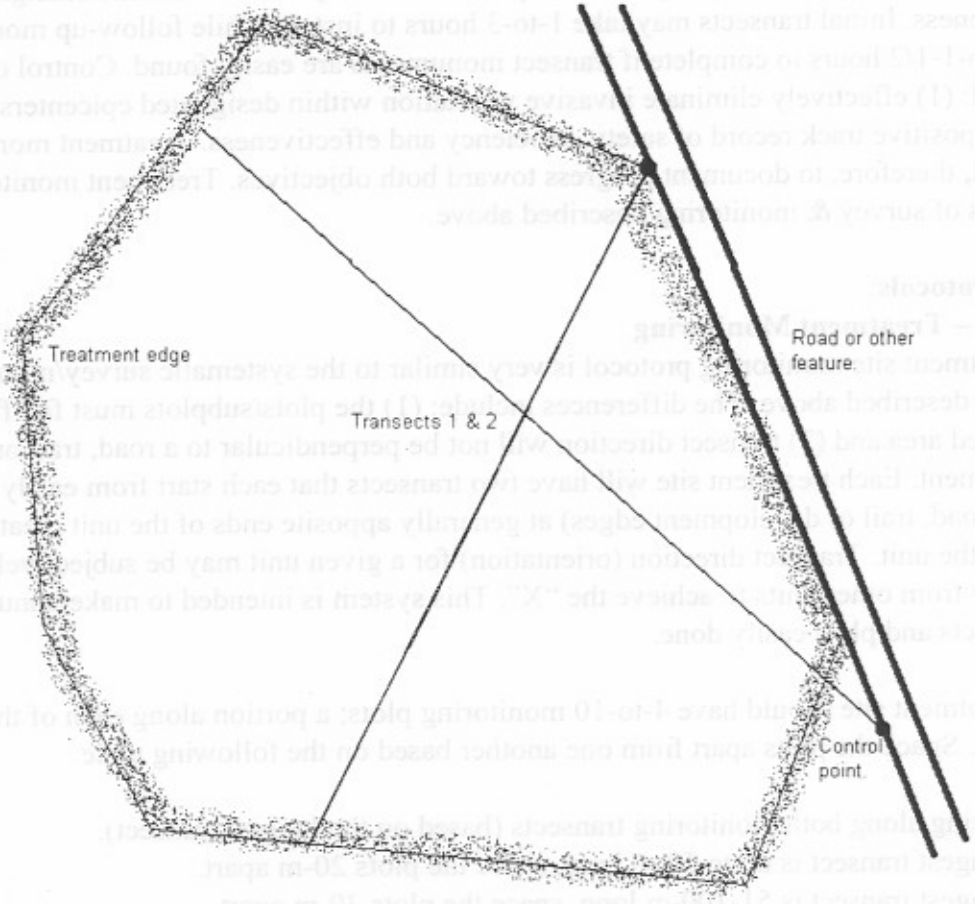

Figure 2. Treatment monitoring diagram.

II.2. – Treatment Site Mapping

Map the location of treatment sites for follow-up and effectiveness monitoring. Create this map only if the treatment area differs from the epicenter mapping already noted above.

(a) Maps should be developed using a photocopy of appropriate USGS 7.5-minute quadrangles and the most recent aerial photography.
(b) Each map should identify its quadrangle name; site name, UTM coordinates of the site center (using GPS), and sketch of the area. Landmark features such as roads, trails, bridges, fences, etc., should be clearly indicated. Natural features, including large trees,

forest/field edges, rock outcrops, and streams may also be useful for relocating exotic sites.

(c) Where possible, use GPS to delineate the exterior epicenter boundary.

(d) Complete an *Invasive Vegetation Management Site Record* for each mapped site and enter the appropriate information into the Alien_Ops database program. (See Part III below.)

The site record and accompanying maps should be filed with the other known alien epicenter location files being maintained by the SHEN-NCR-Operations & Planning Branch Chief. Copies of materials should be made freely available to host parks upon request.

Data sheets (Protocols):

[Where "9" and "1-a" represent single-digit numeric and alpha entries, respectively.]

Invasive Vegetation Survey **Site Record** -- Record information about the transect location.

Verifications:

- Field checked: Initials of person who field checked the data to ensure all field information was correctly entered.
- Entered in DB: Date and initials of person(s) who entered the data into the database.
- DB verified: Date & initials of the person(s) who verified the accuracy of the electronic data to the hard copy.

Field Information:

- Invasive Plant [6-a]: Species code. Leave this blank for the survey. It is used for specific epicenter or treatment mapping.
- Site Name [20-a]: create a name no longer than 20 characters. Examples: "Snead Farm Trail," or "Ailanthus-001."
- Park [4-a]: as in APCO/BOWA/COLO/FRSP/GEWA/PETE/RICH/SHEN.
- Area of Park [20-a]: general area descriptor.
- Size of Site [999.9]: Square meters. Leave this blank for the survey. It is used for specific epicenter or treatment mapping. (Refer to *Various Methods of Estimating Area in the Field.*)
- Elevation [9999]: feet above sea level.
- UTM: E:_____N:_____: from GPS finding.
- USGS Quad [15-a]: USGS quad sheet name.
- Site Management Status: Active_____ Inactive_____: Leave this blank for the survey. It is used for specific epicenter or treatment mapping. Acronym indicating the level of exotic control:

  "AA" -- site is ACTIVE and OUT OF CONTROL (predominant cover by exotics);

  "AI" -- site is at an INTERMEDIATE STAGE OF CONTROL (few plants found during last inspection);

  "II" -- site is UNDER CONTROL (no plants found during last inspection) and needs to be checked annually.
- Directions to Starting Point [memo field]: freely describe how to locate the transect starting point. Include referencing trees and other monuments, distances, direction of travel.
- Distance and Magnetic Azimuth to Site: freely describe the distance in meters, and direction in degrees (360 compass points).
- General Site Comments [memo field]: freely describe any notable site features. Pictures and diagrams are very helpful.

Invasive Vegetation Survey **Transect Data Sheet** -- Record information about plot information. This form accommodates 4 plots.

Verifications:

- Field checked: Initials of person who field checked the data to ensure all field information was correctly entered.
- Entered into DB: Date and initials of person(s) who entered the data into the database.
- DB verified: Date & initials of the person(s) who verified the accuracy of the electronic data to the hard copy.

Header information:

- Park [4-a]: NPS 4-digit park code.
- Site name [20-a]: same as site record sheet.
- Crew [14-a]: crewmember first & last initials separated by spaces between people.
- Transect number ["EX"--4-a--99]: "EX" (dash) park code (dash) a unique two-digit number.
- Bearing [999]: transect magnetic compass bearing.
- Date [mm/dd/yyyy]: date of fieldwork.
- Slope % [99]: slope at plot (or average of epicenter) in percent.
- Aspect [4-a]: the direction of downslope, such as NW, NNW, etc., or "Flat."
- Cover type [4-a]: CONI=conifer; HDWD=hardwood; MIX=mixed conifer & hardwood; COVE=cove hardwood, or moist site; OPEN=open field, grass, or agricultural field.
- Slope position [2-a]: SU=summit; SH=shoulder, upper slope; BS=back slope, mid-slope; FS=foot slope, lower slope; TS=toe slope, bottom slope; TE=terrace, bench or flat; FP=flood plain, stream bottom.

Specific plot information:

- Subplot number [99]: the plot numbers along transect.
- Distance (m) from origin [99]: in meters. Though the first plot will be of various lengths from the point of origin, subsequent plots will be at 20-m multiples from the first plot for systematic surveys and various length multiples for monitoring surveys.
- Species [6-a]: use the target invasive species codes. For species not on that list, create a 6-digit code by using the first 3 digits of genus and first 3 digits of species.
- Count by layer [99]: number of stems by species & layer (herbaceous/shrub/tree) within the subplot. (Plants must be rooted in the subplot.)
- Cover % [999]: percent cover by species & layer (herbaceous/shrub/tree) within the subplot (whether or not it is rooted in the subplot). The cover percent for an area may potentially be 300%, that is 100% for each layer.

Invasive Vegetation Survey **Interplot Comments/Notes** -- Record information about conditions between plots along the transect.

Verifications:

- Field checked: Initials of person who field checked the data to ensure all field information was correctly entered.

- Entered into DB: Date and initials of person(s) who entered the data into the database.
- DB verified: Date & initials of the person(s) who verified the accuracy of the electronic data to the hard copy.

Field data:

- Site name [20-a]: same as site record sheet.
- Crew [14-a]: crewmember first & last initials separated by spaces between people.
- Transect number [99]: same as data sheet.
- Bearing [999]: transect magnetic compass bearing.
- Date [mm/dd/yyyy]: date of fieldwork.
- Between plot numbers [9-9]: referring to the area between plots, 1&2, for example.
- Comments [memo field]: freely describe the area between plots and any impacting features such as openings, disturbance, erosion, invasive species, etc.
  Record the slope.

Field checked _____
Entered in DB _____
DB verified _____

NPS-NER-Virginia Invasive Vegetation Management Team
INVASIVE VEGETATION SURVEY
SITE RECORD

INVASIVE PLANT _____ SITE NAME _____

PARK (4-code) _____

AREA OF PARK _____

SIZE OF SITE _____

ELEVATION _____ UTM: E: _____ N: _____

USGS QUAD _____

SITE MANAGEMENT STATUS: ACTIVE ___ INACTIVE ___

1. DIRECTIONS TO STARTING POINT / EPICENTER (circle one and provide narrative):

DISTANCE AND MAGNETIC AZIMUTH TO SITE:

2. GENERAL SITE COMMENTS:

Field checked ______
Entered in DB ______
DB verified ______

NPS-NER-Virginia Invasive Vegetation Management Team
INVASIVE VEGETATION SURVEY
TRANSECT DATA SHEET

Park (4-code):__________ Site name:______________________________ Crew:______________

Transect number:____________________ Bearing:____________________ Date(s): ____________

Slope %:_______ Aspect:________ Cover type:__________________ Slope position:______________

Subplots

Subplot number:______________

Distance (m) from origin:______________

Species (6-digit)	Count by layer Herb.	Shrub	Tree	Cover (%) H / S / T
______	____	____	____	___/___/___
______	____	____	____	___/___/___
______	____	____	____	___/___/___
______	____	____	____	___/___/___
______	____	____	____	___/___/___
______	____	____	____	___/___/___
______	____	____	____	___/___/___
______	____	____	____	___/___/___
______	____	____	____	___/___/___

Subplot number:______________

Distance (m) from origin:______________

Species (6-digit)	Count by layer Herb.	Shrub	Tree	Cover (%) H / S / T
______	____	____	____	___/___/___
______	____	____	____	___/___/___
______	____	____	____	___/___/___
______	____	____	____	___/___/___
______	____	____	____	___/___/___
______	____	____	____	___/___/___
______	____	____	____	___/___/___
______	____	____	____	___/___/___
______	____	____	____	___/___/___

Subplot number:______________

Distance (m) from origin:______________

Species (6-digit)	Count by layer Herb.	Shrub	Tree	Cover (%) H / S / T
______	____	____	____	___/___/___
______	____	____	____	___/___/___
______	____	____	____	___/___/___
______	____	____	____	___/___/___
______	____	____	____	___/___/___
______	____	____	____	___/___/___
______	____	____	____	___/___/___
______	____	____	____	___/___/___
______	____	____	____	___/___/___

Subplot number:______________

Distance (m) from origin:______________

Species (6-digit)	Count by layer Herb.	Shrub	Tree	Cover (%) H / S / T
______	____	____	____	___/___/___
______	____	____	____	___/___/___
______	____	____	____	___/___/___
______	____	____	____	___/___/___
______	____	____	____	___/___/___
______	____	____	____	___/___/___
______	____	____	____	___/___/___
______	____	____	____	___/___/___
______	____	____	____	___/___/___

Field check _____
Entered in DB _____
DB verified _____

NPS-NER-Virginia Invasive Vegetation Management Team
INVASIVE VEGETATION SURVEY
INTERPLOT COMMENTS / NOTES

Site name:_____Crew:_____

Transect number:_____Bearing:_____Date:_____

Between plot numbers:_____

COMMENTS:

Between plot numbers:_____

COMMENTS:

Various Methods of Estimating Area in the Field[1]

A. Trees

Total number of trees >=3-cm diameter at breast height (DBH = 1.37-meters above ground) multiplied by 2 square meters.

B. Shrub Species and Multiple Tree Seedlings

1. Contiguous Cover: Multiply length measurement and width measurement taken to the nearest 0.5 square meters.

2. Non-Contiguous Cover: To estimate the area coverage of a site with non-contiguous cover:

(a) Measure the total area of the site using the methodology for contiguous cover;

(b) Stand at a location that allows visual assessment of the entire site;

(c) Using a density scale. Density rating scale for estimating percent cover by an exotic species), estimate the percent area covered by the exotic species. This step is to be completed by two different field personnel and a consensus must be reached; and,

(d) Divide the estimated percent cover by one hundred and multiply by the total area of the site to compute the estimate total coverage by the exotic species.

Estimated Percent Cover / 100 x Total Area = Estimated Total Coverage

C. Ground Cover

1. Contiguous Cover: Multiply length measurement and width measurement taken to the nearest 0.5 square meters.

2. Non-Contiguous Cover: Same as B-2

Estimated Percent Cover / 100 x Total Area = Estimated Total Coverage

D. Single Plant Herbs

Number of plants is tallied and multiplied by 0.2 square meters.

E. Extremely Large Sites

For exotic sites that are extremely large and with a varied degree of coverage, area measurements may not be feasible (e.g. thousands of mimosa growing on a road cut for several miles). These sites should not be measured for area but conveyed in the REMARKS section of the database.

[1] Provided by Kris Johnson, Vegetation Management Specialist, NPS-GSRM.

Appendix E -- NEPA/NHPA Compliance

Monitoring Equipment List

_____ Compass (declination correction set to zero)

_____ Clinometer

_____ 100-m tape

_____ 30-m tape

_____ Magnifying glass

_____ Spherical densiometer

_____ GPS unit (is battery charged?)

_____ Field notes holder (aluminum)

_____ Field sheets:

Site Record

Transect Data Sheet

Interplot Comments/Notes

_____ Monitoring protocols

_____ Invasive species code sheet

_____ Random number table

_____ Slope correction table

_____ Pencils

_____

_____

_____

_____

Appendix E -- NEPA/NHPA Compliance

Environmental Screening Form

Project Description/Location:

As described in the *Strategic Plan for Managing Alien Invasive Vegetation: George Washington Birthplace National Monument*, this project includes field treatments and monitoring to control highly invasive non-native vegetation. Treatment sites were chosen based upon a ranking criterion that included evaluation of individual alien species threat and zonal considerations for resource protection and risk. Treatments are called for throughout the park on a limited site-specific basis. Methodologies include hand pulling, cutting, and herbicide application depending on best management practices for given alien invasive species and its preponderance. Specific treatments are indicated in Appendix-B of the *Strategic Plan*. New project sites will be added to that list within the guidance of the *Strategic Plan* as added field information is gathered and appropriately evaluated. Treatment methods will be adaptively refined through follow-up monitoring.

Mandatory Criteria (A-M). **Would the proposal, if implemented:**

	Yes	No	Data Needed to Determine
A. Have significant adverse effects on public health or safety?		x	
B. Have adverse effects on such unique characteristics as historic or cultural resources, park, recreation or refuge lands, wilderness areas, wild or scenic rivers, sole or principal drinking water aquifers, prime farmlands, wetlands, flood-plains, or ecological significant or critical areas, including those listed on the National Register of Natural Landmarks?		x	
C. Have highly controversial environmental effects?		x	
D. Have highly uncertain and potentially significant environmental effects or involve unique or unknown environmental risks?		x	
E. Establish a precedent for future action or represent a decision in principle about future actions with potentially significant environmental effects?		x	
F. Be directly related to other actions with individually insignificant, but cumulatively significant environmental effects?		x	
G. Have adverse effects on properties listed or eligible for listing on the National Register of Historic Places?		x	
H. Have adverse effects on species listed or proposed to be listed on the List of Endangered or Threatened Species, or have adverse effects on designated Critical Habitat for these species?		x	

	Yes	No	Data Needed to Determine
I. Require compliance with Executive Order 11988 (Floodplain Management), Executive Order 11900 (Protection of Wetlands), or the Fish and Wildlife Coordination Act?		x	
J. Threaten to violate a federal state, local or tribal law or requirement imposed for the protection of the environment?		x	
K. Require a permit from a federal, state or local agency to proceed, unless the agency from which the permit is required agrees a CE is appropriate?		x	
L. Have the potential for significant impact as indicated by a federal, state or local agency or Indian Tribe?		x	
M. Have the potential to be controversial regardless of its impact?		x	

(Tailor the following to meet individual park unit/project needs.)

Are measurable impacts possible on the following physical, natural or cultural resources?

	Yes	No	Data Needed to Determine
1. Geological resources – soils, bedrock, streambeds, etc.		x	
2. From geohazards		x	
3. Air Quality, Traffic, or from Noise		x	
4. Water quality or quantity		x	
5. Streamflow characteristics		x	
6. Marine or Estuarine Resources		x	
7. Floodplains or wetlands		x	
8. Land use, including occupancy, income, values, ownership, type of use		x	
9. Rare or unusual vegetation – old growth timber, riparian, alpine		x	

	Yes	No	Data Needed to Determine
10. Species of special concern (plant or animal; state or federal listed or proposed for listing) or their habitat		x	
11. Unique ecosystems, biosphere reserves, World Heritage sites		x	
12. Unique or important wildlife or wildlife habitat		x	
13. Unique or important fish or fish habitat		x	
14. Introduce or promote non-native species (plant or animal)		x	
15. Recreation resources, including supply, demand, visitation, activities, etc.		x	
16. Visitor experience, aesthetic resources		x	
17. Cultural resources, cultural landscape, sacred sites, etc.		x	
18. Socioeconomics, including employment, occupation, income changes, tax base, infrastructure, etc.		x	
19. Minority and low income populations, ethnography, size, migration patterns, etc.		x	
20. Energy resources		x	
21. Other agency or tribal land use plans or policies		x	
22. Resource, including energy, conservation potential		x	
23. Urban quality, gateway communities, etc.		x	
24. Long-term management of resources of land/resource productivity		x	
25. Other important environmental resources.		x	

Please answer the following questions.

1. Are the personnel preparing this form familiar with the site, and/or has a site visit been conducted? (Attach additional pages noting when site visit took place, staff attending, etc.)

Yes. Rijk Moräwe and James Åkerson conducted field reconnaissance on September 23, 1999, with follow-up field information gathering by Rijk during 1999 and 2000. Their data analysis and prescriptive conclusions are described in the aforesaid *Strategic Plan*.

2. Has consultation with all affected agencies or tribes been completed? (Attach additional pages detailing the consultation, including the name, date and summary of comments from other agency or tribal contacts.)

This action will take place wholly within GEWA. Portions of treatment areas are adjacent to neighboring properties; the park may chose to cooperate with those landowners to jointly address invasive species. However, treatments without a larger context are appropriate and will not impact those lands.

Ron Stouffer, Engineer with the Northern Virginia Field Office, Corps of Engineers, advised us by phone on February 9, 2000, that invasive vegetation treatments without excavation do not need permits from that agency.

Appropriate attachments:

_X_ map(s) – see the *Strategic Plan*

____ site visit notes

_X_ agency consultation – as above

_X_ relevant data or reports – see the *Strategic Plan*

_X_ categorical exclusion form

Categorical Exclusion Form

Project: Alien Invasive Vegetation Monitoring & Control **Date**: February 10, 1999

Describe project, including location (reference the attached Environmental Screening Form, if appropriate):

Refer to the attached Environmental Screening Form and the attached *Strategic Plan for Managing Alien Invasive Vegetation.*

Describe the category used to exclude action from further NEPA analysis and indicate the number of the category (see Section 3-4 of NPS-12):

- Restoration of non-controversial native species into suitable habitats within their historic range, and elimination of exotic species (516 DM2 App. 7.4 E(6)).
- Stabilization by planting native plant species in disturbed areas (516 DM2 App. 7.4 E(4)).
- Non-destructive data collection, inventory, study, research, and monitoring activities (516 DM2 App. 2, 1.6).
- Day-to-day resource management and research activities (516 DM2 App. 7.4 E(2)).

Describe any public or agency involvement effort conducted (reference the attached ESF):

This is a cooperative effort of national parks within the Virginia Subcluster, Chesapeake-Allegheny Cluster, Northeast Region. Technical expertise has been drawn upon from Shenandoah National Park, the Philadelphia Support Office, and several regional exotic pest plant councils.

On the basis of the environmental impact information in the statutory compliance file, with which I am familiar, I am categorically excluding the described project from further NEPA analysis. No exceptional circumstances (e.g., all boxes in the ESF are marked "No") or conditions in section 3-6 apply, and the action is fully described in section 3-4 of NPS-12.

_____ _____

Park Superintendent or Designee (signature) Date

_____

Title

Rijk Moräwe	Resource Management Specialist
NPS Contact Person	Title
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